Part IV. Extended Flight Phase, Third Annual Period (July 1, 1968 — July 1, 1969)

I. Introduction

A. Support Summary

The successful support of *Pioneer VI* by the DSN during the period from July 1, 1968 to July 1, 1969 included spacecraft solar occultation and full superior conjunction with the sun. Solar occultation began November 21, 1968 and ended November 25, 1968. The capabilities of the DSS 14 210-ft-diam antenna were required from October 20 to December 20 for the experiment. Support problems for the network were caused by commitment of DSS 14, which alone tracked *Pioneer VI*, to support an *Apollo* project, by rework on the antenna's main bearing checks of low-film height, and by the installation of equipment to enhance a *Mariner* 1969 occultation experiment. These occurrences were in 1969.

When the annual report period began, the *Pioneer VI* spacecraft was some 293 million km from earth, the greatest distance of separation thus far reached. At the end of the period, the spacecraft was some 283 million km from earth. Transmission of commands to the spacecraft was resumed in September 1968. Efforts to send commands had ceased in March 1968 because the high-gain antenna aboard the spacecraft could not be employed and because of the distance of the spacecraft from earth.

B. Solar Occultation

The spacecraft probe's orbit resulted in a line of sight from the probe to the earth that caused the RF signal to pass through the solar corona and to be occulted by the sun during the second half of November 1968. The polarization of the spacecraft probe was linear; it was spin-stabilized with respect to the plane of the ecliptic. Measurement was made of the plane of polarization of the signal received from the spacecraft. Faraday rotation produced by the interaction of the RF signal with the solar corona was inferred from the measurements.

1. Experiment. The modified multifrequency cone was reinstalled on the 210-ft antenna at the Mars station on September 18. These modifications permitted closed-loop tracking of the angle of the plane of polarization. The initial installation permitted manual positioning of the polarizer and the obtaining of an error signal. Initially, data was taken manually. The plane of polarization was deduced by observation of the time-of-error-signal zero crossing for a given position of the polarizer. On October 26, the polarization servo tracking loop was closed and autotracking data of the plane of polarization of the signals received from *Pioneer VI* was obtained. During this time, the effects of the diurnal variations of the earth's ionosphere were clearly observed.

On November 4, for a period of 2 h, normal polarization, which was approximately 97 deg (due to the combination of the spacecraft's orientation of 90 deg to the plane of the ecliptic and the earth's ionospheric effects of approximately 7 deg), swung dramatically to approximately 65 deg. This event occurred when the line of sight to the spacecraft was at approximately 10 solar radii from the limb of the sun. As the line of sight approached the solar limb, a steady-state rotation apparently occurred.

The last signals were obtained as the line of sight approached the sun on November 17. The solar side lobes caused large increases in system temperature at the same time the solar corona caused spectral broadening. These two effects made it impossible to track any further. From November 21 to 25, the spacecraft was physically occulted by the sun. It was not possible to reacquire the space signal until November 29. From November 29 through December 8, the spacecraft was again tracked. The experiment was terminated on December 8.

2. Trajectory results. Trajectory results for the solar occultation are summarized in Figs. 56 and 57. Figure 56 plots the sun–earth–probe angle vs time during November. The sun–earth–probe angle is given in degrees in the trajectory period, but in Fig. 56 a kind of normalized angle is shown. This angle is the ratio of the sun–earth–probe angle to the sun–earth–limb of sun angle. Occultation occurred at the times that the curve crosses the value 1.0. The solar radius and sun–earth distance used to determine the sun–earth–limb of sun angle are 0.695×10^6 and 150×10^6 km, respectively.

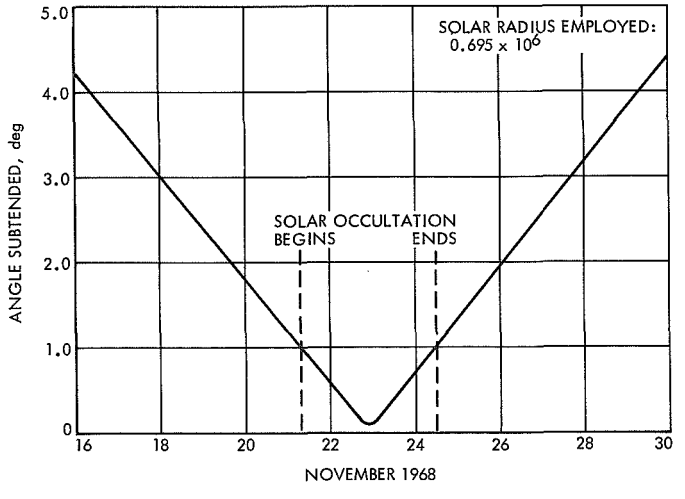

Fig. 56. Solar occultation plot

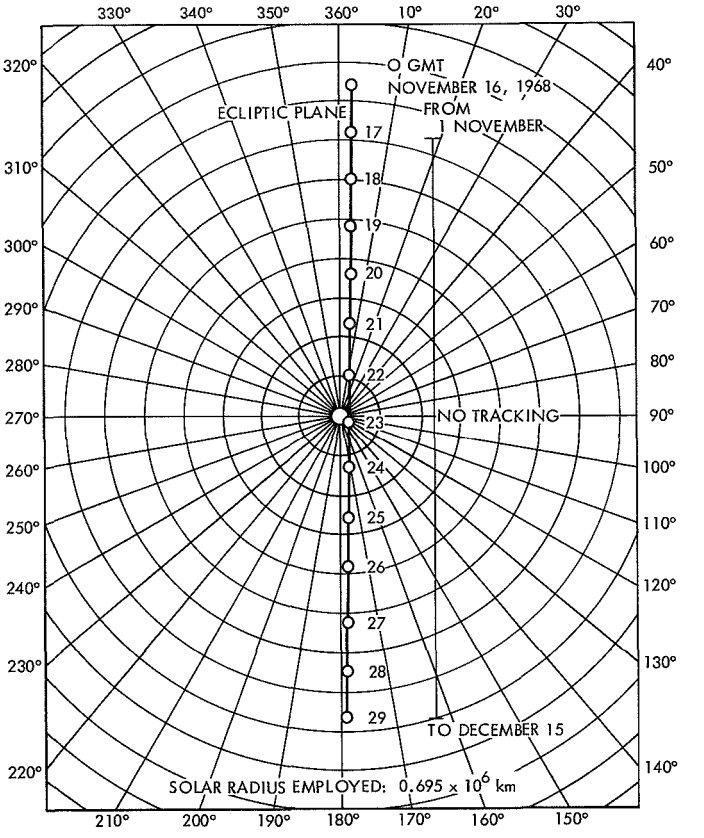

Fig. 57. Movement of *Pioneer VI* behind solar disk during November 1968

These result in a solar angular semidiameter of 0.27 deg. (Sun–earth–limb of sun angle, solar angular semidiameter at earth, and angle subtended at earth by one solar radius are the same.)

In Fig. 57, the solar occultation of the spacecraft is shown in a more geometric way. The circle represents the disc of the sun, and the line and time dots represent the progress of the spacecraft into and out of occultation. The point of view is that of an observer at earth looking toward the sun along the sun–earth line. The quantity plotted radially in Fig. 57 is essentially the sun–earth–probe angle, but again normalized by dividing by the solar angular semidiameter.

C. Solar Activity

Solar activity was at a high level during most of March 1969, with numerous small flares occurring. There were several active regions capable of producing major flares under the surveillance of satellites and observers on earth.

On March 30, after the most active of these regions had rotated behind the west limb of the sun and could no longer be observed from earth, there occurred the largest 10-cm radio burst in the corona ever recorded by terrestrial radio telescopes. Within about 2 h, cosmic-ray instruments aboard earth satellites and *Pioneers VI, VIII,* and *IX* were recording a marked increase in the intensity of low- and high-energy protons. From these measurements, it was assumed that a large solar proton flare had occurred on the backside of the sun. During this time, neutron monitors on earth showed a slight enhancement with gradual onset, so the effects at the earth's surface were slight. About a day later, cosmic-ray instruments aboard *Pioneer VII* showed increases in intensity.

The energy particle detectors aboard earth satellites and *Pioneers VIII* and *IX* began indicating reduced intensity within a few days after the March 30 event, and by April 5 the readings of those aboard *Pioneers VI* and *VII* began to subside. During the period from March 31 through April 9, solar activity on the visible side of the sun, as recorded by terrestrial observatories, was at a very low level, with only minor subflares reported.

By April 10, the active region which had produced the earlier proton flare had rotated on the far side of the sun to a position about 20 deg behind the east limb. On this date, it again erupted, producing a large proton flare. Within a half hour, cosmic-ray intensities recorded by *Pioneers VI* and *VII* jumped by more than an order of magnitude, but the instruments aboard *Pioneers VIII* and *IX* and those at earth showed essentially no change.

II. Engineering and Operations

A. Tracking

Pioneer VI was tracked by DSS 14 for a total of 1251 h 13 min during the period from July 1, 1968 to July 1, 1969 (passes 929 through 1292). The tracking time by quarter was as follows:

Tracking period	Passes	Total tracking time, h-min
Jul, Aug, Sep 1968	929–1020	375:40
Oct, Nov, Dec 1968	1021–1107	357:25
Jan, Feb, Mar 1969	1138–1202	183:55
Apr, May, Jun 1969	1204–1292	334:13

During the months of August 1968 and March 1969, tracking was in excess of the time scheduled. The percentages were: August 100.30; March 102.32; and April 103.66.

Open-loop recording began on pass 1065 during November, at the request of the *Pioneer* occultation experimenters. DSS 14 was unable to acquire the spacecraft on passes 1077 through 1079 because of the superior conjunction. Solar activity in the vicinity of *Pioneer VI* affected passes 1267, 1268, and 1269. On pass 1267, three severe jumps occurred in the doppler data; no anomaly was located at the station. On pass 1268, blunder points still appeared in the doppler data. The station equipment was rechecked, but no anomaly was found. On pass 1269, four blunder points were recorded in the doppler data. The solar activity still existed in the *Pioneer VI* area, but the intensity was low.

B. Significant Problems and Improvements

Engineering improvements during the reporting period included installation of a second autocollimator, the replacement of the S-band Cassegrain ultracone with an S-band multiple frequency (SMF) cone, and the development of a means to reduce high noise in the metric data.

Installation of the autocollimator was completed during September 1968. (The autocollimator operated in the manner of an optical tracking device by taking a beam of light and generating error signals. These error signals were fed into the antenna servoelectronics, moving the antenna to a no-error position between the antenna and master equatorial.) The SMF, also installed in September, was capable of simultaneously transmitting and receiving orthogonally cross-polarized linear signals while maintaining a low system noise temperature, approximately 22°K (Fig. 58). This capability was referred to as mode 1. When the SMF was in the matched linear polarized mode, using the diplexer, the system noise was approximately 31°K. This capability was referred to as mode 2. The SMF could use other modes, but they were not applicable to *Pioneer* support.

When the source of high noise in the metric data was diagnosed to be from a 1-MHz cleanup loop put in for the planetary ranging subsystem in June 1968, a 10-Hz signal was developed in the subsystem. This 10-Hz signal provided the same reference signals as the free-running 20-Hz oscillator with associated multipliers that had been replaced. However, the planetary ranging subsystem 10-Hz signal was referenced to the DSS atomic standard.

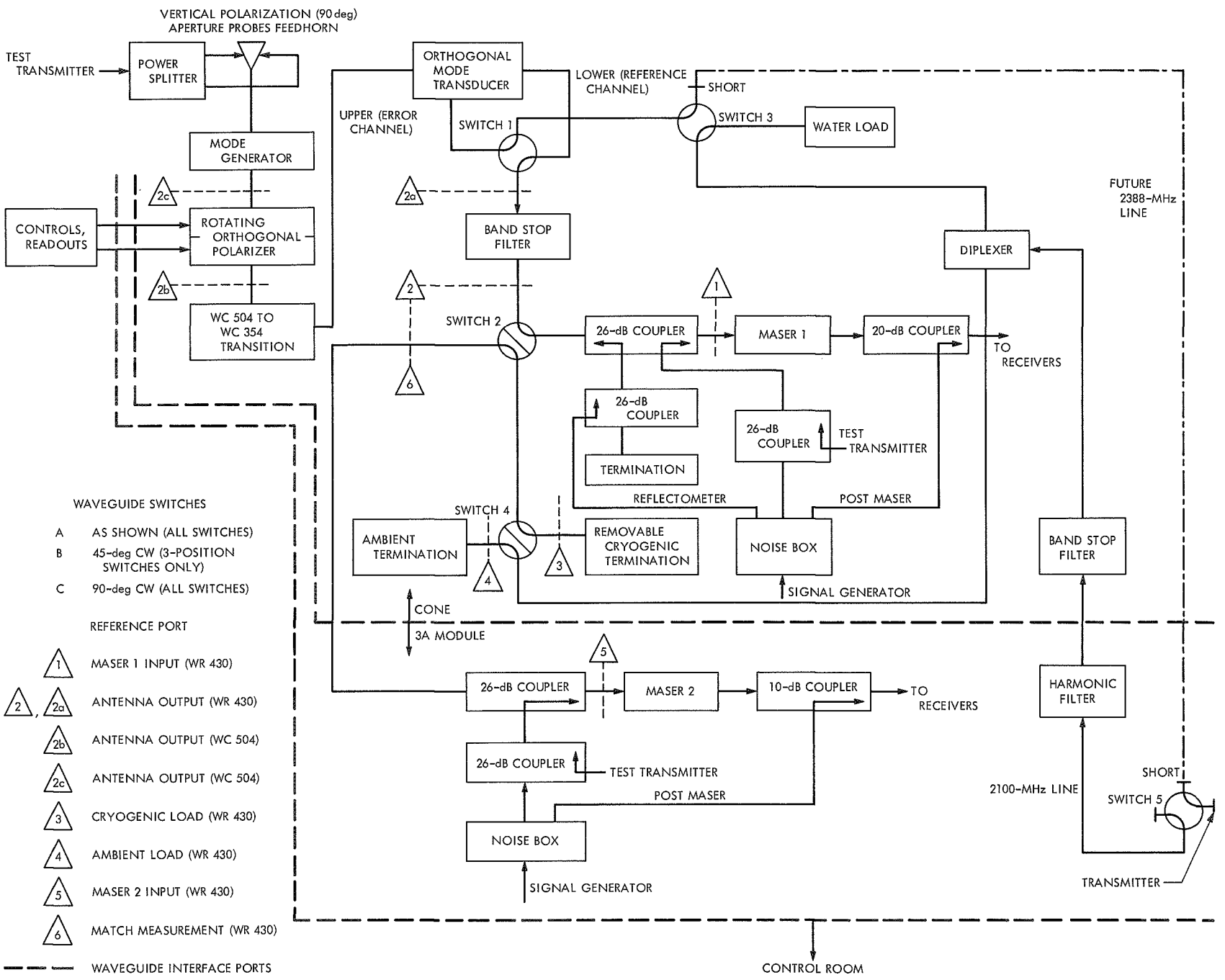

Fig. 58. SCM cone configuration

During May 1969, tests were performed on the tracking loop bandwidth (2 B_{LO}) to determine optimum telemetry threshold. There had been numerous receiver glitches caused by the spacecraft signal approaching threshold. The tests, which indicated that 3 Hz was the optimum bandwidth, were performed using the *Pioneer* simulator with a 2 B_{LO} of 3, 6, 9, and 12 Hz. On pass 197, at DSS 12, a test was performed using *Pioneer IX* data to confirm the previous test results (Fig. 59).

The test, commenced in the 12-Hz, 2 B_{LO} position, was switched to 6 Hz for the first half of the pass, and finally switched to 3 Hz for the remainder of the pass. The bit error rates printed out every 12 min were averaged. The results showed a direct relationship of signal-to-noise-ratio to probability of error. The equivalent improvement when the 2 B_{LO} was changed from 12 to 3 Hz was 1.4 dB. When changed from 12 to 6 Hz, the improvement was 0.9 dB, and the improvement from 6 to 3 Hz amounted to 0.5 dB.

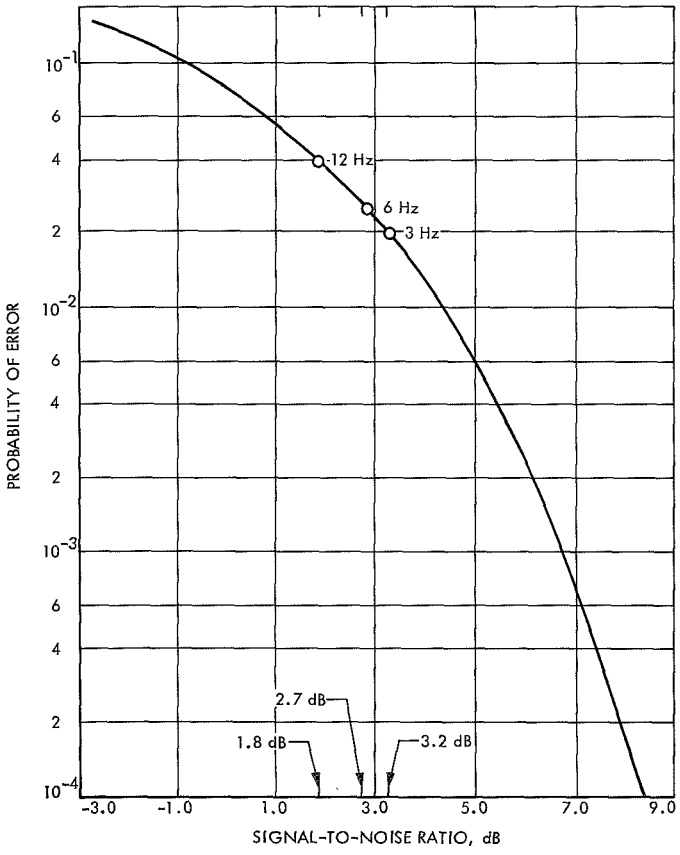

Fig. 59. *Pioneer IX* tracking loop bandwidth test results (May 1969) used to conform previous test results for all *Pioneer* spacecraft

A major irregularity during late 1968 which entailed extensive investigation was the problem of occasional spurious interrupts in the TCP that caused loss of real-time data. Because of the intermittent nature of the problem, it took more than 2 mo to isolate and correct the irregularity. Spurious word parity errors on decoded data had been caused by transients on the decoding computer paralleled input (PIN) lines. These transients generated excessive noise for the logic (one) state on the operational processing computer PIN lines.

After the problem was isolated, Ames Research Center sent to DSS 14 and all other *Pioneer* GOE-equipped stations Modification 11 for the computer buffer. Modification 11 changed the timing on the decoded data clock to the center of the data period, which triggered the interrupt to the operational processing computer. This change ensured that both computers would not address the buffer simultaneously.

C. Radio Metric Data Information

1. Good data time. Percentages of good data obtained from total actual tracking time were reported for various monthly periods during the annual period covered here (Figs. 60–64). Good data was obtained during July and

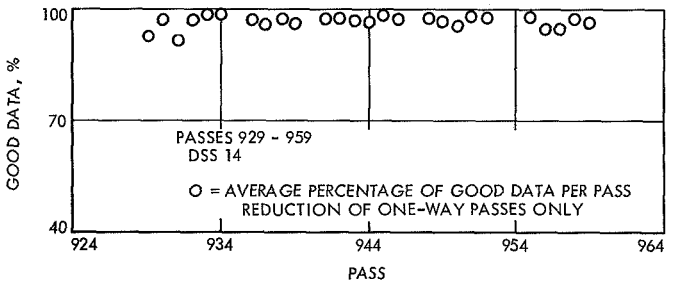

Fig. 60. Percentage of good metric data vs pass number (July 1968)

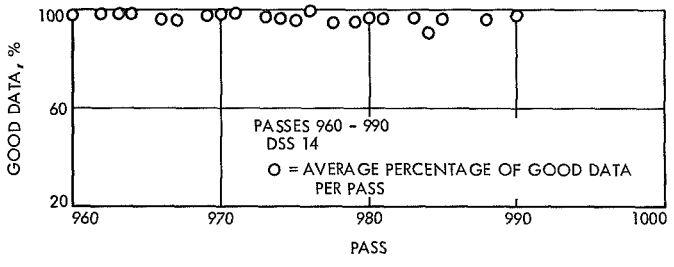

Fig. 61. Percentage of good metric data vs pass number (August 1968)

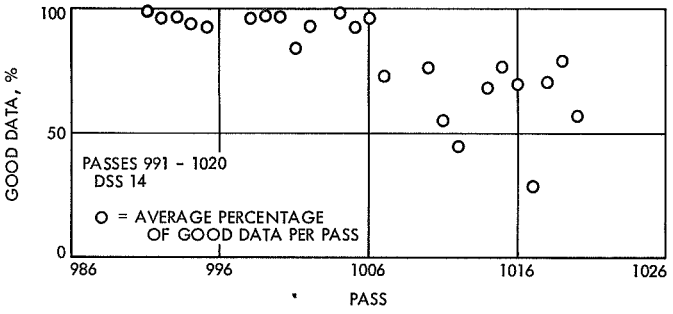

Fig. 62. Percentage of good metric data vs pass number (September 1968)

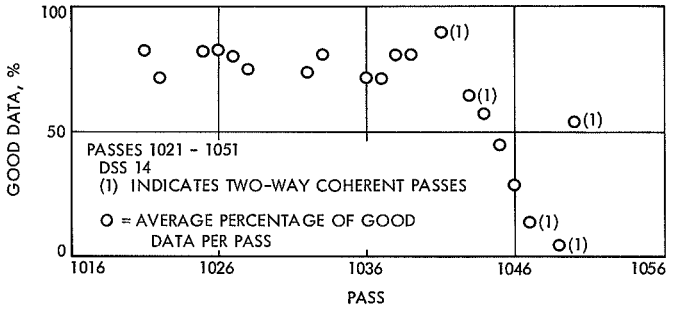

Fig. 63. Percentage of good metric data vs pass number (October 1968)

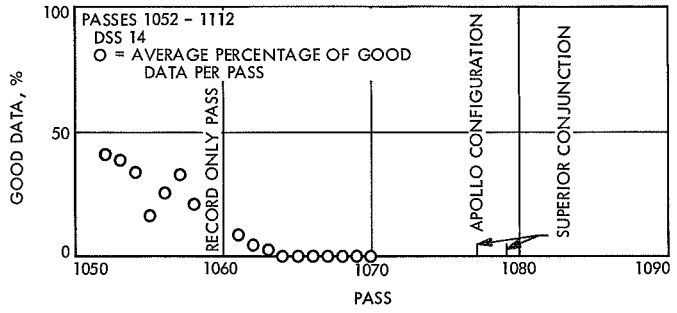

Fig. 64. Percentage of good metric data vs pass number (November and December 1968)

August 1968 for approximately 97% of the actual tracking time. The percentage was 79.84 during September, but fell to 58.79 during October. Solar occultation caused low percentages during November and December. There was no data in January 1969 because of station rework activity, and during February there was no analysis of the few tracks. Good metric data was obtained for 81.88% of the actual tracking time during March and for 85.61% of the actual tracking time during April. Percentages were not figured for May and June.

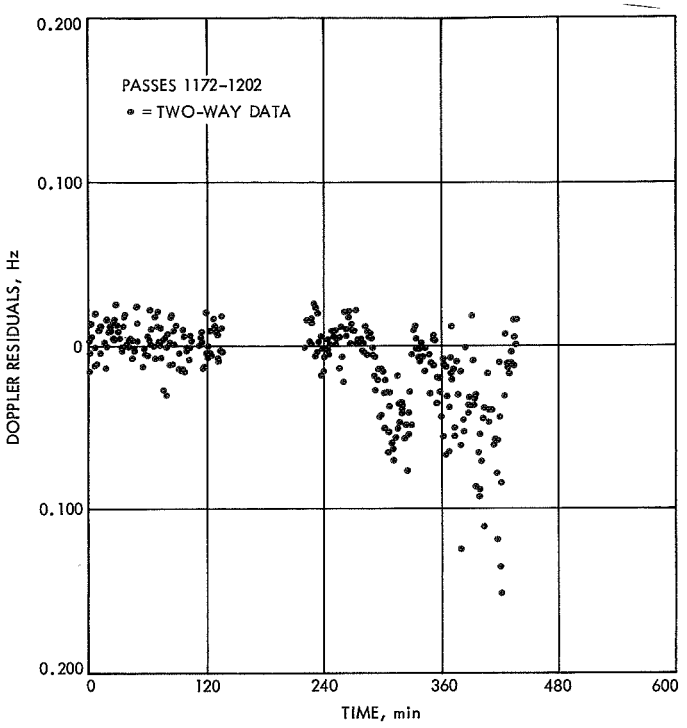

Fig. 65. High noise in doppler data believed caused by doppler counter problem (March 1969)

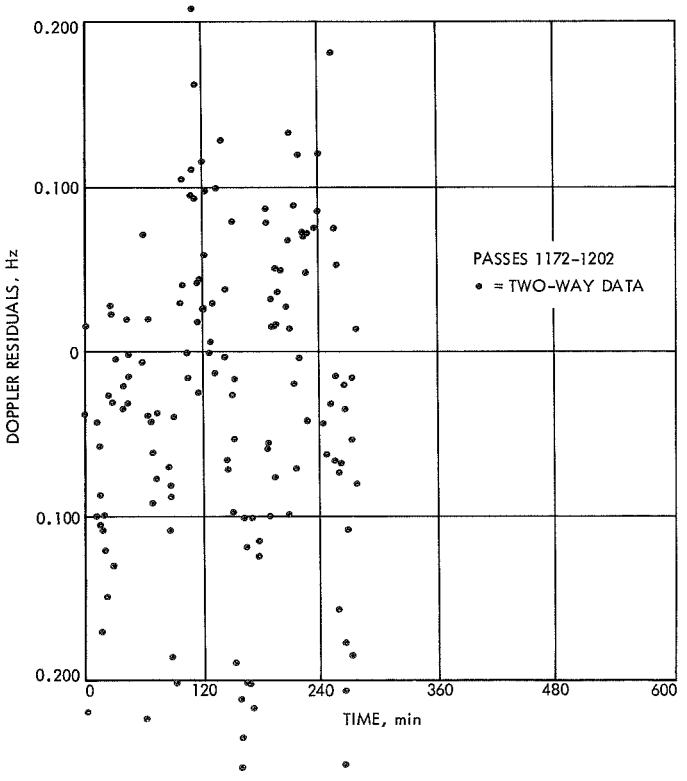

Fig. 66. Doppler counter problem causing high noise in data (March 1969)

2. Doppler information. Figures 65 and 66 illustrate a precision orbit determination program (SPODP) plot of true residuals. These residuals were the difference between actual tracking data and the calculated data from the orbit determination process. Figure 65 illustrates that the doppler problem first occurred at approximately 2243. Doppler bias and noise vs pass number are illustrated by Figs. 67–71. The changing doppler bias during April, May, and June indicated need for an updated orbit. The doppler bias changed from −275 to −375 Hz during April, from +68 to +108 Hz during May, and from +110 to +157 Hz during June.

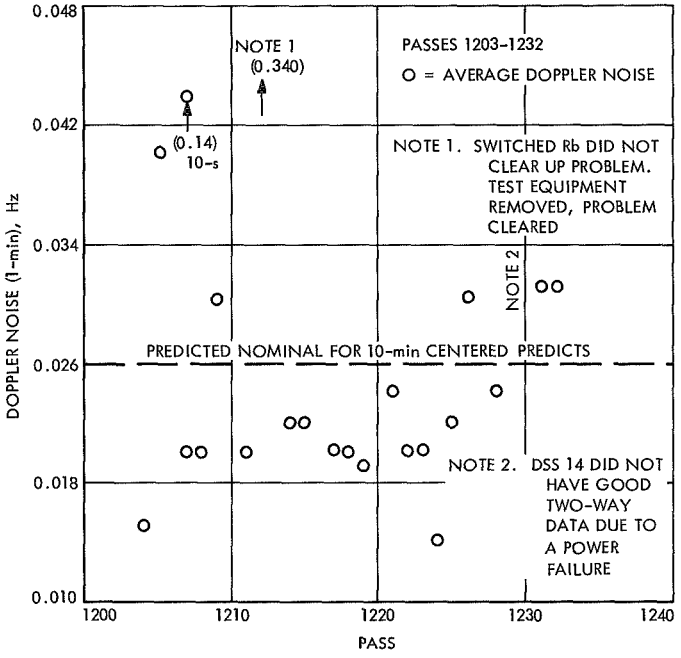

Fig. 67. Average doppler noise vs pass number (April 1969)

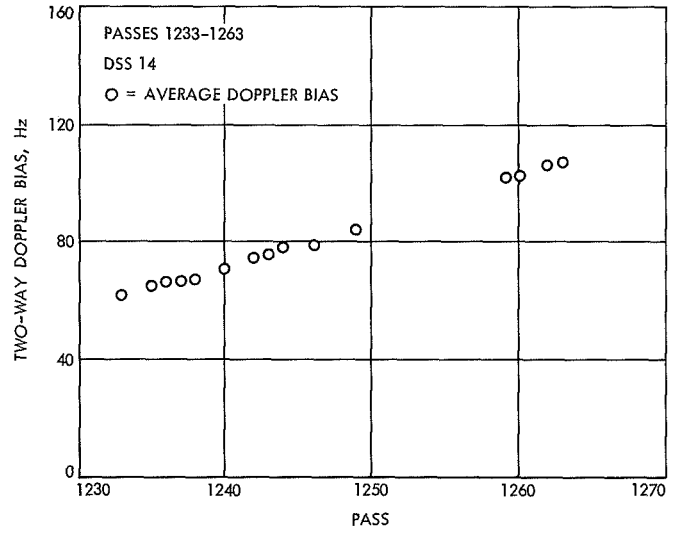

Fig. 68. Average doppler bias vs pass number (May 1969)

D. Anomalies Related to Telemetry Data Losses

Some instances of data losses and the anomalies that caused them during this report period are singled out here. The pass chronology contains additional information. Deep Space Station 14 tuned 101 min in attempts to gain two-way lock on pass 1177, having used an incorrect frequency in attempting to acquire the spacecraft in two-way mode. The antenna went to brake because of low film height on Pad 3. Two min 33 s of telemetry data

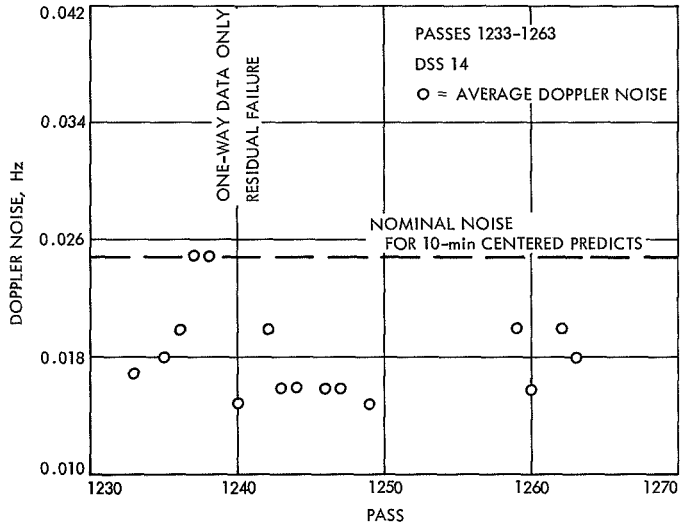

Fig. 69. Average doppler noise vs pass number (May 1969)

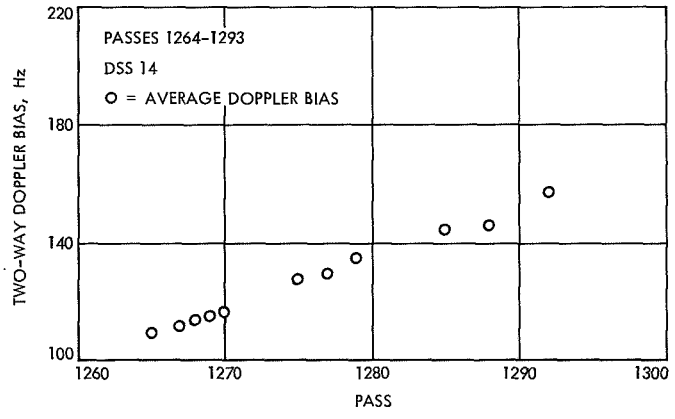

Fig. 70. Average doppler bias vs pass number (June 1969)

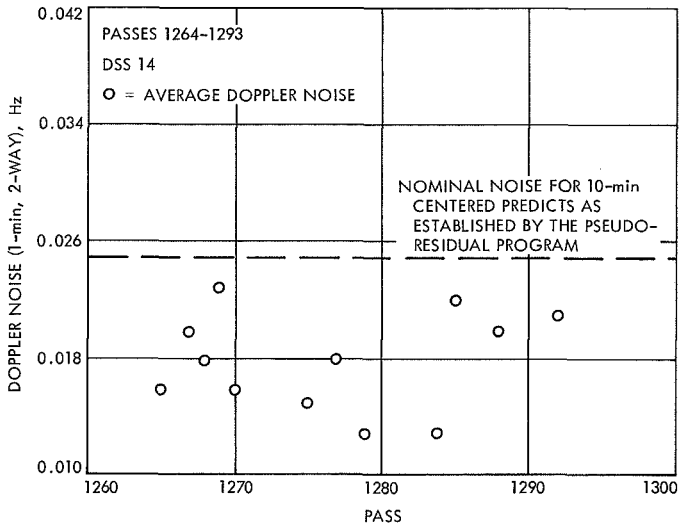

Fig. 71. Average doppler noise vs pass number (June 1969)

was lost. On pass 1178, the station had a power surge and lost binary-coded decimal time. The high noise was believed a result of a timing error caused by the power surge. The antenna went to brake and the receiver dropped lock because of low film height at 2025:56. One min 20 s of data was lost.

No anomaly was found as the cause for the high noise throughout pass 1181 as the station tracked in a two-way noncoherent mode. The received signal strength was 9.4 dBmW above threshold; the receiver was believed to be dropping cycles.

On pass 1188 at 1611:27, the station switched to S-band multiple frequency (SMF) mode 2 (a two-way matched polarized linear mode for use only on channel 7) and attempted to acquire the spacecraft on channel 6. Three h 5 min of data was lost. Channel 7 was acquired at 2010:20; it was noisy.

The station experienced high noise on pass 1212 and switched from rubidium 1 to rubidium 2, but the noise continued. Communication outage occurred from 2033 to 2039. The high noise appeared to be caused by a timing offset. Noise spikes ranged from 60 to 80 cycles. There was high noise caused by a resolver malfunction throughout pass 1232.

E. RF Performance

Table 33 presents receiver signal strengths for passes 929 through 1292. The actual downlink signal strengths have been plotted in Figs. 72–79 to illustrate characteristic trends, if any, in the station performance. The predicted downlink signal strength curves using circular and linear polarization are shown along with actual received downlink signal strength to establish the accuracy of the predictions. For January, February, and March, prediction plots are not presented because of the small number of passes.

The actual downlink signal strength was within 1 dBmW of the predicted signal strength using linear polarization during July. Consistency was maintained through August and September (1.1 dBmW). On pass 1002, the strength was degraded on both receivers, and maser 1 was replaced by maser 2. The cause of degradation on pass 1012 was not ascertained. Receiver glitching occurred throughout the month of October, causing some fluctuation of the data points, which still were within 1.2 dBmW of the predicted values.

The actual downlink signal strength values during November are plotted in Fig. 76 to graphically illustrate the characteristic trend due to a full superior conjunction with the sun. The predicted downlink signal strength curve is shown superimposed over the actual downlink signal strength values to determine the accuracy of the predictions. Figure 76 also indicates the decreasing signal strength (passes 1052–1070) as the spacecraft approached solar occultation. Passes 1095–1107 were within 1 dBmW of predictions, except for pass 1099, which had a 2.5-dBmW stronger signal level than predicted.

During November and December, the actual strength for all passes using linear polarization was within 2 dBmW of the predicted signal strength curve. The signal level was approximately 3 dBmW below the predicted curve during April. During May, the signal strength was within 1 dBmW of prediction, except for pass 1263, which was within approximately 2 dBmW of predictions. The signal level varied within 2 dBmW of predictions during June.

F. Parity Error Rate

Table 33 and Figs. 80–87 present parity error rates and plots for the reporting period. (A parity error rate of 0.116 was equivalent to 1 error in 1000 consecutive bits of information and was regarded as the limiting value for the uncoded and convolution-coded unit modes of information.) During the first quarter (July, August, September 1968), the telemetry bit rate mode was 8 bits/s.

Table 33. Summary of Operations, Passes 929–1292

Pass No.	DSS No.	Day of Year	Acq. Time	End of Track	Ground Mode: Start/Stop Time 1-Way	2-Way	3-Way	Signal Strength Avg (dbm)	Configuration: Loop BW (Hz)	Temp Pre/ Post (°K)	Thres Pre/ Post (dbm)	No. of Cmds	Average PER	Bit Rate	Comments
929	14	183	1225	1600	1225 1600			-163.5	12	17.4	-178	0	0.000	8	P0/D0/B12 from 1225 to 1239, and P1/D0/B12 from 1239 to 1600.
930	14	184	1226	1735	1226 1735			-163.3	3	18.7	-182	0	0.000	8	P1/D0/B3 from 1226 to 1735.
931	14	185	1251	1735	1251 1735			-163.9	12	17.9	-176	0	0.000	8	P1/D0/B12 from 1251 to 1735.
932	14	186	1229	1735	1229 1735			-163.6	12	17.3	-179	0	0.000	8	P1/D0/B12 during entire pass.
933	14	187	1625	2030	1625 2030			-162.9	12	16.2	-176	0	0.000	8	P1/D0/B12.
934	14	188	1606	2030	1606 2030			-163.1	12	17.5	-178	0	0.000	8	P1/D0/B12.
935	14	189	1235	1735	1235 1735			-163.0	12	18.9	-176	0	0.000	8	P1/D0/B12 from 1235 to 1735.
936	14	190	1228	1600	1228 1600			-163.3	12	16.9	-176	0	0.000	8	P1/D0/B12 from 1228 to 1600.
937	14	191	1234	1705	1234 1705			-163.0	12	18.9	-178	0	0.000	8	P1/D0/B12 from 1234 to 1705.
938	14	192	1229	1705	1229 1705			-163.9	12	18.4	-178	0	0.000	8	P1/D0/B12 from 1229 to 1705.
939	14	193	1229	1705	1229 1705			-163.4	12	17.9	-178	0	0.000	8	P1/D0/B12 from 1229 to 1705.
941	14	195	1618	2030	1618 2030			-163.0	12	18.4	-178	0	0.000	8	P1/D0/B12 from 1618 to 2030. Twenty minutes of data were lost due to three commercial power glitches.
942	14	196	1230	1707	1230 1707			-163.3	12	16.8	-179	0	0.000	8	P1/D0/B12 during entire pass.
943	14	197	1231	1600	1231 1600			-163.0	12	16.8	-179	0	0.000	8	P1/D0/B12 from 1231 to 1600.

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Pass No.	DSS No.	Day of Year	Acq. Time	End of Track	Ground Mode: Start/Stop Time 1-Way	2-Way	3-Way	Signal Strength Avg (dbm)	Configuration: Loop BW (Hz)	Temp Pre/ Post (°K)	Thres Pre/ Post (dbm)	No. of Cmds	Average PER	Bit Rate	Comments
944	14	198	1232	1740	1232 1740			-163.2	12	17.1	-179	0	0.000	8	P1/D0/B12 from 1232 to 1740.
945	14	199	1232	1740	1232 1740			-163.7	12	17.0	-179	0	0.000	8	P1/D0/B12 from 1232 to 1740.
946	14	200	1233	1740	1233 1740			-163.2	12	17.1	-178	0	0.000	8	P1/D0/B12 from 1233 to 1740.
948	14	202	1621	2030	1621 2030			-163.1	12	17.9	-178	0	0.000	8	P1/D0/B12 during entire pass.
949	14	203	1234	1740	1234 1740			-162.7	12	17.5	-178	0	0.000	8	P1/D0/B12 during entire pass.
950	14	204	1235	1830	1235 1830			-163.2	12	17.4	-179	0	0.000	8	P1/D0/B12.
951	14	205	1236	1830	1236 1830			-163.7	12	17.3	-176	0	0.000	8	P1/D0/B12.
952	14	206	1522	2100	1522 2100			-163.0	12	17.0	-179	0	0.000	8	P1/D0/B12.
955	14	209	1238	1745	1238 1745			-163.8	12	17.7	-178	0	0.000	8	P1/D0/B12.
956	14	210	1238	1745	1238 1745			-163.2	12	29.1	-178	0	0.000	8	P1/D0/B12.
957	14	211	1239	1745	1239 1745			-163.2	12	16.9	-179	0	0.000	8	P1/D0/B12. At 1353, receiver was out-of-lock for 30 seconds due to operator error.
958	14	212	1231	1745	1231 1745			-163.0	12	16.7	-179	0	0.000	8	P1/D0/B12.
959	14	213	1240	1745	1240 1745			-163.6	12	17.1	-179	0	0.000	8	P1/D0/B12.

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Table 33 (contd)

Pass No. PN 6	DSS No.	Day of Year	Acq. Time	End of Track	Ground Mode Start/Stop Time 1-Way	2-Way	3-Way	Signal Strength Avg (dbm)	Configuration Loop BW (Hz)	Temp Pre/ Post (°K)	Thres Pre/ Post (dbm)	No. of Cmds	Average PER	Bit Rate	Comments
960	14	214	1241	1800	1241 1800			-161.80	12	17.10	-176		0.000	8	P1/D0/B12.
962	14	216	1243	1745	1243 1745			-162.80	12	17.60	-176		0.000	8	P1/D0/B12.
963	14	217	1244	1745	1244 1745			-162.70	12	17.20	-176		0.000	8	P1/D0/B12.
964	14	218	1245	1750	1245 1750			-162.60	12	17.50	-176		0.000	8	P1/D0/B12.
965	14	219	1245	1750	1245 1750			-163.00	12	17.80	-176		0.000	8	P1/D0/B12.
966	14	220	1246	1750	1246 1750			-163.20	12	17.60	-176		0.000	8	P1/D0/B12.
967	14	221	1247	1700	1247 1700			-162.50	12	17.50	-176		0.000	8	P1/D0/B12.
969	14	223	1248	1750	1248 1750			-162.40	12	17.50	-178		0.000	8	P1/D0/B12.
970	14	224	1249	1748	1249 1748			-163.30	12	16.70	-179		0.000	8	P1/D0/B12.
971	14	225	1250	1700	1250 1700			-163.00	12	17.20	-178		0.000	8	P1/D0/B12.
973	14	227	1252	1755	1252 1755			-163.00	12	17.20	-178		0.000	8	P1/D0/B12. At 1525, Magnetic Tape 1A and 1B would not record the receiver in lock indication due to damaged patch board (TFR-125921).
974	14	228	1252	1550	1252 1550			-163.00	12	17.20	-174		0.015	8	P1/D0/B12.
975	14	229	1255	1550	1255 1550			-163.00	12	17.30	-176		0.000	8	P1/D0/B12.
976	14	230	1557	2030	1557 2030			-163.30	12	17.50	-177		0.000	8	P1/D0/B12.
977	14	231	1255	1755	1255 1755			-163.50	12	16.80	-177		0.005	8	P1/D0/B12.
979	14	233	1300	1800	1300 1800			-163.50	12	16.80	-176		0.000	8	P1/D0/B12.

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Pass No. PN 6	DSS No.	Day of Year	Acq. Time	End of Track	Ground Mode Start/Stop Time 1-Way	2-Way	3-Way	Signal Strength Avg (dbm)	Configuration Loop BW (Hz)	Temp Pre/ Post (°K)	Thres Pre/ Post (dbm)	No. of Cmds	Average PER	Bit Rate	Comments
980	14	234	1259	1800	1259 1800			-163.10	12	17.60	-177		0.000	8	P1/D0/B12.
981	14	235	1259	1800	1259 1800			-163.00	12	17.30	-177		0.000	8	P1/D0/B12.
983	14	237	1300	1800	1300 1800			-163.50	12	17.30	-177		0.000	8	P1/D0/B12.
984	14	238	1301	1800	1301 1800			-162.70	12	16.40	-177		0.000	8	P1/D0/B12.
985	14	239	1302	1805	1302 1805			-162.80	12	17.00	-179		0.000	8	P1/D0/B12.
986	14	240	1303	1805	1303 1805			-162.90	12	17.60	-179		0.000	8	P1/D0/B12.
987	14	241	1305	1805	1305 1805			-163.00	12	16.70	-177		0.000	8	P1/D0/B12.
988	14	242	1305	1805	1305 1805			-163.00	12	16.90	-178		0.000	8	P1/D0/B12.
990	14	244	1307	1805	1307 1805			-162.40	12	17.50	-177		0.000	8	P1/D0/B12.

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Table 33 (contd)

Pass No.	DSS No.	Day of Year	Acq. Time	End of Track	Ground Mode Start/Stop Time 1-Way	2-Way	3-Way	Signal Strength Avg (dbm)	Configuration Loop BW (Hz)	Temp Pre/ Post (°K)	Thres Pre/ Post (dbm)	No. of Cmds	Average PER	Bit Rate	Comments
991	14	245	1308	1805	1308 1805			-162.5	12	17.3	-177		0.000	8	P1/D0/B12.
992	14	246	1310	1810	1310 1810			-163.6	12	17.6	-177		0.000	8	P1/D0/B12.
993	14	247	1310	1810	1310 1810			-162.7	12	17.4	-177		0.000	8	P1/D0/B12.
994	14	248	1318	1810	1316 1810			-162.8	12	16.6	-177		0.000	8	P1/D0/B12.
995	14	249	1324	1810	1324 1810			-163.4	12		-178		0.000	8	P1/D0/B12.
997	14	251	1314	1815	1314 1815			-162.8	12	17.0	-178		0.000	8	P1/D0/B12.
998	14	252	1315	1610	1315 1610			-162.8	12	17.1	-179		0.000	8	P1/D0/B12. Hydrostatic bearing pad recess flow failure.
999	14	253	1316	1700	1316 1700			-162.6	12	17.1	-174		0.000	8	P1/D0/B12.
1000	14	254	1317	1820	1317 1820			-162.8	12	17.3	-176		0.000	8	P1/D0/B12.
1001	14	255	1318	1820	1318 1820			-162.3	12	17.1	-177		0.000	8	P1/D0/B12.
1002	14	256	1319	1820	1319 1820			-162.4	12	17.0	-178		0.000	8	P1/D0/B12 from 131921 to 145000 and P1/D1/B12 from 145000 to 182000.
1004	14	258	1322	1820	1322 1820			-162.1	12	16.2	-178	0	0.000	8	P1/D0/B12 during entire pass.
1005	14	259	1324	1820	1324 1820			-162.1	12	16.7	-179	0	0.000	8	P1/D0/B12 during entire pass.
1006	14	260	1325	1800	1325 1820			-162.5	12	17.0	-176	0	0.000	8	P1/D0/B12.
1007	14	261	1325	0030	1325 1527	1527* 0030		-162.5	12	16.3	-176	6	0.000	8	P1/D1/B12. One slight RCVR glitch at 2125. *Two-way noncoherent.

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Pass No.	DSS No.	Day of Year	Acq. Time	End of Track	Ground Mode Start/Stop Time 1-Way	2-Way	3-Way	Signal Strength Avg (dbm)	Configuration Loop BW (Hz)	Temp Pre/ Post (°K)	Thres Pre/ Post (dbm)	No. of Cmds	Average PER	Bit Rate	Comments
1010	14	264	1330	1825	1330 1825	NONCOHERENT		-162.9	12	31.7	-175	4	0.012	8	P1/D1/B12.
1011	14	265	1330	1825	1330 1825	NONCOHERENT		-163.5	12	32.0	-177	5	0.100	8	P1/D1/B12. Command (CMD) aborted. ANT to brake, low film height on Pad 3 dipped to 0.0015, ANT to point film height checks okay. Dirt in oven from 127.1 to 140.0° at 1800.
1012	14	266	1330	1835	1330 1835			-164.2	12	31.6	-175	4	0.000	8	P1/D1/B12. At 1648, low film height on Pads 1 and 3. ANT to brake.
1014	14	268	1332	1827	1332 1827	NONCOHERENT		-162.2	12	31.4	-175	4	0.020	8	P1/D1/B12 from 1332 to 1802 and P1/D0/B12 from 1802 to 1827. Several RCVR glitches.
1015	14	269	1339	1828	1339 1828	NONCOHERENT		-162.3	12	31.9	-175	4	0.020	8	P1/D1/B12.
1016	14	270	1334	1829	1334 1829	NONCOHERENT		-162.1	12	31.7	-175	2	0.030	8	P1/D1/B12.
1017	14	271	1336	1831	1336 1831			-162.6	12	32.0	-174		0.000	8	P1/D1/B12. Overvoltage tripped transmitter.
1018	14	272	1336	1832	1336 1832	NONCOHERENT		-162.6	12	32.2	-174	2	0.040	8	P1/D1/B12.
1019	14	273	1338	2100	1338 2100	NONCOHERENT		-162.5	12	32.1	-174	2	0.060	8	P1/D1/B12.
1020	14	274	1339	1600	1339 1600	NONCOHERENT		-162.4	12	32.7	-175		0.100	8	P1/D1/B12.

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Table 33 (contd)

Pass No.	DSS No.	Day of Year	Acq. Time	End of Track	Ground Mode Start/Stop Time 1-Way	2-Way	3-Way	Signal Strength Avg (dbm)	Configuration Loop BW (Hz)	Temp Pre/ Post (°K)	Thres Pre/ Post (dbm)	No. of Cmds	Average PER	Bit Rate	Comments
1021	14	275	1340	1840	1340 1840	NONCOHERENT		-162.3	12	31.7	-174	2	0.070	8	P1/D1/B12.
1022	14	276	1357	1840	1357 1840	NONCOHERENT		-162.2	12	31.8	-174	4	0.038	8	P1/D1/B12. Polarizer failed.
1023	14	277	1343	1840	1343 1840	NONCOHERENT		-162.2	12	31.8	-174	8	0.000	8	S-Band Multiple Frequency Cone (SMF) Mode 2/B12.
1025	14	279	1346	1840	1348 1840	NONCOHERENT		-161.5	12	22.6	-175	3	0.008	8	Mode 1/B12.
1026	14	280	1347	1840	1347 1840	NONCOHERENT		-161.9	12	22.8	-175	2	0.000	8	Mode 1/B12.
1027	14	281	1348	1840	1348 1840	NONCOHERENT		-161.5	12	22.8	-175	2	0.000	8	Mode 1/B12.
1028	14	282	2029	0000	2029 0000	NONCOHERENT		-161.4	12	22.7	-175	2	0.000	8	Mode 1/B12. TXR off at 2313 due to broken coolant hose.
1032	14	286	1403	2315	1403 2315	NONCOHERENT		-161.2	12	22.7	-175	4	0.080	8	SMF Mode 1/B12. Due to a loose RCVR connector, RCVR 1 was switched to RCVR 2. TXR tripped off ac overcurrent.
1033	14	287	1357	1845	1357 1845	NONCOHERENT		-161.5	12	22.8	-175	2	0.000	8	Mode 1/B12. Power glitch - station switched to diesel power at 1757.
1035	14	289	CANCELLED												
1036	14	290	1402	1745	1402 1745	NONCOHERENT		-162.8	12	22.5	-176	2	0.010	8	Mode 1/B12.
1037	14	291	1405	1700	1405	NONCOHERENT		162.1	12	22.7	-175	2	0.000	8	Mode 1/B12.
1038	14	292	1404	1930	1404 1930	NONCOHERENT		162.7	12	23.3	-177	2	0.040	8	Mode 1/B12. Recorder 1 malfunction.
1039	14	293	1405	1850	1405 1850	NONCOHERENT		-162.3	12	22.5	-176	2	0.020	8	Mode 1/B12.
1041	14	295	1409	2300	1409 1904 2231 2300	1904 2231		-162.2	12	22.4	-176	11	0.010	8	Mode 1/B12.

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Pass No.	DSS No.	Day of Year	Acq. Time	End of Track	Ground Mode Start/Stop Time 1-Way	2-Way	3-Way	Signal Strength Avg (dbm)	Configuration Loop BW (Hz)	Temp Pre/ Post (°K)	Thres Pre/ Post (dbm)	No. of Cmds	Average PER	Bit Rate	Comments
1043	14	297	1412	2400	1412 1646 2301 2400	1646 2301		-162.6	12	23.3	-175	12	0.038	8	Mode 1/B12. TXR tripped twice.
1044	14	298	1750	2400	1750 2400	NONCOHERENT		-162.2	12	23.4	-175	3	0.300	8	Mode 1/B12.
1045	14	299	1415	1800	1415 1800	NONCOHERENT		-162.7	12	23.0	-175	3	0.300	8	Mode 1/B12.
1046	14	300	1802	2200	1802 2200	NONCOHERENT		-163.4	12	22.8	-176	3	BAD	16	Mode 1/B12.
1047	14	301	1418	2330	1418 1637 1707 1800	1637 1707 1800 2330		-162.5	12	22.5	-176	12	0.800 BAD	8 16	Mode 1/B12.
1049	14	303	1422	2032	1422 1847 2001 2032	1847 2001		-162.7	12	22.6	-176	7	0.600	8	Mode 1/B12 from 1422 to 1537, Mode 3/B12 from 1537 to 1624, and Mode 1/B12 from 1624 to 2032. RCVR glitching badly.
1050	14	304	1426	1930	1426 1616 1848 1930	1616 1848		-162.6	12	22.7	-175	8	0.750	8	Mode 1/B12.
1051	14	305	1427	2330	1427 2330	RECORD ONLY		-163.4	12						Mode 1/B12.

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Table 33 (contd)

Pass No.	DSS No.	Day of Year	Acq. Time	End of Track	Ground Mode Start/Stop Time 1-Way	2-Way	3-Way	Signal Strength Avg (dbm)	Configuration Loop BW (Hz)	Temp Pre/ Post (°K)	Thres Pre/ Post (dbm)	No. of Cmds	Average PER	Bit Rate	Comments
1052	14	306	1427	2301	1427 1521 2254 2300	1521 2254		-163.3	12	23.3	-176	21	BAD	8	Mode 1/B12. GOE failed to transmit CMD 101 at Z00000.
1053	14	307	1429	0007	1429 1631 2136 0007	1631 2136		-163.5	12	23.4	-175	15	BAD	8	Mode 1/B12. TCP not locking up.
1054	14	308	1431	2330	1431 1701 1852 2330	1701 1852		-163.6	12	22.5	-175	24	BAD	8	Mode 1/B12.
1055	14	309	1433	2300	1433 1945	1945* 2300		-163.0	12	22.6	-175	4	BAD	8	Mode 1/B12. Recorder failure. *Non-coherent.
1056	14	310	1435	2300	1435 1610	1610* 2300		-163.5	12	33.7	-175	12	BAD	8	Mode 1/B12. *Noncoherent.
1057	14	311	1436	2300	1436 1700	1700 2300		-163.5	12	22.4	-176	10	BAD	8	Mode 1/B12.
1058	14	312	1438	2300	1438	1651		-163.6	12	22.4	-178	18	BAD	8	Mode 1/B12.
1059	14	313	1447	2300	1447 2300			-165.0	12						Mode 1/B12. Record only.
1060	14	314	1441	2300	1441 2300			-164.5	12						Mode 1/B12. Record only.
1061	14	315	1443	2300	1443 2300			-165.0	12	22.5	-177				Mode 1/B12. Unable to lock TCP.
1062	14	316	1445	2400	1445 2400			-167.3	12	22.4	-177				Mode 1/B12.
1063	14	317	1449	0001	1449 0001			-170	12	23.1	-178				Mode 1/B12.**

**TCP UNABLE TO LOCK UP DUE TO SUN OCCULTATION. GROUND RECEIVER SIGNAL LEVELS FLUCTUATING OVER WIDE RANGE.

JPL T 10363 (4-68)

Pass No.	DSS No.	Day of Year	Acq. Time	End of Track	Ground Mode Start/Stop Time 1-Way	2-Way	3-Way	Signal Strength Avg (dbm)	Configuration Loop BW (Hz)	Temp Pre/ Post (°K)	Thres Pre/ Post (dbm)	No. of Cmds	Average PER	Bit Rate	Comments
1064	14	318	1450	2300	1450 2300			-172	12	50.3	-177				Mode 1/B12.
1065	14	319	1455	2400	1455			-172	12	50.3	-177				Ground Receiver signal too erratic to measure.**
1066	14	320	1518	2400	1518 2400			-172	12	22.6	-178				Mode 1/B12.**
1067	14	321	1455	2359	1455 2359			-174	12	22.8	-177				Mode 1/B12.**
1068	14	322	1512	2400	1512 2400			-173	12	22.5	-179				Mode 1/B12.**

NOTE: FROM DAYS 323 TO 332 DSS 14 WAS ENGAGED IN TRACKING PIONEER VI USING NON-DSIF OPEN LOOP RECEIVER FOR THE FOLLOWING EXPERIMENTS:

FARADAY ROTATION - G. LEVY
SPECTRUM WIDENING - R. GOLDSTEIN
RELATIVISTIC - J. ANDERSON

PIONEER DATA WAS NOT TAKEN ON THIS EXPERIMENTAL TRACKING DUE TO INABILITY TO LOCK UP ON THE EXCESSIVELY NOISY SIGNAL.

1078	14	332	1550	2400	*			*	12	22.7	-177	NONE	*		*Uncertain as to RCVR lock. Signal evidently beyond threshold. Occultation.
1079	14	333	1519	2345					12	23.1	-177	NONE			Same as above. G. Levy on-site experimenting.
1080	14	334	1539	2315				-176	12	22.9	-177	NONE			RCVR's in and out of lock. No stable signal. Open and closed loop operations.
1081	14	335	1521	2345				-177	12	22.6	-177	NONE			Intermittent RCVR lock - approximately 30%.

**TCP UNABLE TO LOCK UP DUE TO SUN OCCULTATION. GROUND RECEIVER SIGNAL LEVELS FLUCTUATING OVER WIDE RANGE.

JPL T 10363 (4-68)

Table 33 (contd)

Pass No.	DSS No.	Day of Year	Acq. Time	End of Track	Ground Mode Start/Stop Time 1-Way	2-Way	3-Way	Signal Strength Avg (dbm)	Configuration Loop BW (Hz)	Temp Pre/ Post (°K)	Thres Pre/ Post (dbm)	No. of Cmds	Average PER	Bit Rate	Comments
1082	14	336	1525	2313					12	22.7	-177	NONE			Intermittent lock. Station set antenna to "stow" due to high winds.
1095	14	349	2221	0013	2221 0013			-161.9	12			0	BAD	8	Mode 1/B12.
1096	14	350	1625	0014	1625 0014			-162.7	12			0	BAD	8	Mode 1/B12.
1099	14	353	1912	2142	1912 2142			-160.0	12	48.5	-173	0	0.000	8	SMF Mode 3/B12.
1100	14	354	1940	2130	1940 2130			-161.9	12	36.0	-175.5	0	0.000	8	SMF Mode 3/B12.
1101	14	355	1943	2326	1943	2047		-162.3	12	33.6	-176.5	2			SMF Mode 3/B12. At 2139, lost U bus. Generator TXR off. ANT to brake (TFR-132168). At 2152, U power up. At 2237, TCP interrupt. Reason unknown.
1107	14	361	1640	2116	1640 1931	1931* 2116		-162.5	12	23.6	-176	2	0.000	8	*Noncoherent.
1107	14	361	1640	2116	1640	1931		-162.2	12	25.6	-176	2	0.000	8	SMF Mode 3/B12. No recordings due to configuration for Apollo 8.

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Pass No.	DSS No.	Day of Year	Acq. Time	End of Track	Ground Mode Start/Stop Time 1-Way	2-Way	3-Way	Signal Strength Avg (dbm)	Configuration Loop BW (Hz)	Temp Pre/ Post (°K)	Thres Pre/ Post (dbm)	No. of Cmds	Average PER	Bit Rate	Comments
1138	14	026	2100	2352	2100 2206	2206* 2352		-163	12	22.2	-174	2	0.000	8	SMF Mode 1/B12. *Noncoherent mode of operation.

JPL T 10363 (4-68)

Table 33 (contd)

Pass No.	DSS No.	Day of Year	Acq. Time	End of Track	Ground Mode Start/Stop Time 1-Way	2-Way	3-Way	Signal Strength Avg (dbm)	Configuration Loop BW (Hz)	Temp Pre/ Post (°K)	Thres Pre/ Post (dbm)	No. of Cmds	Average PER	Bit Rate	Comments
1145	14	033	1918	2223	1918 2047	2047* 2223		-163	12	49.9	-174	3	0.000	8	SMF/Mode 1/B12. *Spacecraft in two-way noncoherent mode.
1152	14	040	1924	2044	1924 2044			-164.2	12	22.6	-174	0	0.000	8	SMF/Mode 1/B12.
1159	14	047	1604	2048	1604 1753	1753 2048*		-162	12	49.2	-174	2	0.000	8	SMF/Mode 1/B12. Track voice not on magnetic tape due to communication patch not fully seated. *Noncoherent mode.

JPL T 10363 (4-68)

Pass No.	DSS No.	Day of Year	Acq. Time	End of Track	Ground Mode Start/Stop Time 1-Way	2-Way	3-Way	Signal Strength Avg (dbm)	Configuration Loop BW (Hz)	Temp Pre/ Post (°K)	Thres Pre/ Post (dbm)	No. of Cmds	Average PER	Bit Rate	Comments
1177	14	065	1525	2157	1525 2157			-165	12	30.7	-173	0	0.500	8	SMF Mode 2/B12. Unable to acquire uplink - reason unknown.
1178	14	066	1520	2200	1520 1632	1632 2200*		-163.7	12	31.1	173	2	0.150	8	SMF Mode 2/B12. Low-film height on Pad 3 at 2025. *Noncoherent.
1179	14	067	1516	0200	1516 1639	1639 0200*		-164.8	12	21.8	-174	4	0.020	8	SMF Mode 1/B12. *Noncoherent.
1180	14	068	1516	0200	1516 1641	1641 0200*		-164.4	12	22	-175	2	0.000	8	SMF Mode 1/B12. *Noncoherent.
1181	14	069	1514	0100	1514 1632	1632 0100*		-164.3	12	22.6	-174	2	0.000	8	SMF Mode 1/B12. *Noncoherent.
1183	14	071	1554	2300	1554 1718	1718* 2300		-165	12	22.6	-173	2	0.000	8	SMF Mode 1/B12. Acquisition delayed due to missing cable connection between antenna and computer - approximately 40 minutes of tracking lost. *Noncoherent.
1184	14	072	1510	0100	1510 1642	1642* 1807 1807 0038 0038* 0100		-164.8	12	22.2	-175	6			SMF Mode 1/B12. *Noncoherent.
1186	14	074	1507	0100	1507 1728	1729* 0100		-164.5	12	22.1	-174	2	0.000	8	SMF Mode 1/B12. *Noncoherent.
1187	14	075	1517	0100	1517 1622	1622* 0100		-164.4	12	22.4	-174	2	0.000	8	SMF Mode 1/B12. *Noncoherent.
1188	14	076	1519	2300	1519 2010	2010* 2300		-164.3	12	22.4	-174	4	0.000	8	SMF Mode 1/B12. *Noncoherent.
1190	14	078	1504	2300	1504 1628 2204 2300	1628* 1729 1729 2204		-164.5	12	22.2	-175	7	0.000	8	SMF Mode 1/B12. *Noncoherent.

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Table 33 (contd)

Pass No.	DSS No.	Day of Year	Acq. Time	End of Track	Ground Mode Start/Stop Time 1-Way	2-Way	3-Way	Signal Strength Avg (dbm)	Configuration Loop BW (Hz)	Temp Pre/ Post (°K)	Thres Pre/ Post (dbm)	No. of Cmds	Average PER	Bit Rate	Comments
1191	14	079	1500	0100	1500 1621	1621* 1717 1717 0031 0031* 0100		-164.4	12	22.3	-174	10	0.000	8	SMF Mode 1/B12. *Noncoherent.
1193	14	081	1516	0100	1516 1638	1638* 1731 1731 0032 0032* 0100		-165.1	12	24.6	-174	8	0.450 0.000	16 8	SMF Mode 1/B12. *Noncoherent.
1194	14	082	1513	0100	1513 1635	1635* 1731 1731 0032 0032* 0100		-165	12	22.6	-174	9	0.000	16 8	SMF Mode 1/B12. *Noncoherent.
1195	14	083	1655	0100	1655 1845 2000 2103	2103* 2115 2115 0036 0036* 0100		-164.5	12	22.5	-174	8	0.000	8	SMF Mode 1/B12. At 1845, Pioneer VI tracking was stopped to transmit commands to Pioneer VIII. Pioneer VI tracking was resumed at 2000. *Noncoherent.
1198	14	086	1452	0100	1452 1614	1614* 1821 1821 0032 0032* 0100		-164.6	12	22.3	-174	8	0.040	8	SMF Mode 1/B12.
1200	14	088	1450	0100	1450 1606	1606* 1732 1732 0032 0032* 0100		-165.2	12	22.6	-174.2	8	0.000	8	SMF Mode 1/B12. *Noncoherent.

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Pass No.	DSS No.	Day of Year	Acq. Time	End of Track	Ground Mode Start/Stop Time 1-Way	2-Way	3-Way	Signal Strength Avg (dbm)	Configuration Loop BW (Hz)	Temp Pre/ Post (°K)	Thres Pre/ Post (dbm)	No. of Cmds	Average PER	Bit Rate	Comments
1201	14	089	1449	0100	1449 1614 1903 2034	1614* 1708 1708 1903 2034 0035 0035* 0100		-165.1	12	22.6	-174	8	0.000	16	SMF Mode 1/B12. *Noncoherent.
1202	14	090	1736	0100	1736 1905 0032 0100	1905* 1952 1952 0032		-165.1	12	22.5	-174	8	0.000	16	SMF Mode 1/B12. *Noncoherent.

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Table 33 (contd)

Pass No.	DSS No.	Day of Year	Acq. Time	End of Track	Ground Mode Start/Stop Time 1-Way	2-Way	3-Way	Signal Strength Avg (dbm)	Configuration Loop BW (Hz)	Temp Pre/ Post (°K)	Thres Pre/ Post (dbm)	No. of Cmds	Average PER	Bit Rate	Comments
1204	14	92	1449	2300	1449	1622* 1722 1722 2300		-165.1	12	22.7	-175	8	0.000 0.411	16* 16	SMF Mode 1/B12. * Noncoherent.
1205	14	93	1503	0100	1503 1655 2228 2250	1655* 1747 1747 2228 2250 0047* 0047 0100		-164.3	12	22.6	-175	8	0.038 0.600	8 16	SMF Mode 1/B12. FTS PC 141 jumped time causing APS failure. Reset PC 141 (TFR-13293).
1207	14	95	1505	0100	1505 1621	1621* 1702 1702 0032 0032* 1621		-164.5	12	22.6	-175	8	0.080 0.600	8 16	SMF Mode 1/B12. * Noncoherent. AT 0039, Rectifier Beam Interlock kicked XMTR off due to high voltage over-current. Reset Interlock.
1208	14	96	1501	0100	1501 1613	1613* 1702 1702 0032 0032* 0100		-164.5	12	22	-175	8	0.000 0.400	8 16	SMF Mode 1/B12. * Noncoherent.
1209	14	97	1540	0058	1540 1657	1657* 1757 1757 0032 0032* 0058		-165.2	12	22.8	-174	8	0.000 0.500	8 16	SMF Mode 1/B12. * Noncoherent.
1211	14	99	1527	2300	1527 1641	1641* 1732 1732 2242 2242* 2300		-164.9	12	23.2	-175	8	0.000	16	SMF Mode 1/B12. * Noncoherent.

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Pass No.	DSS No.	Day of Year	Acq. Time	End of Track	Ground Mode Start/Stop Time 1-Way	2-Way	3-Way	Signal Strength Avg (dbm)	Configuration Loop BW (Hz)	Temp Pre/ Post (°K)	Thres Pre/ Post (dbm)	No. of Cmds	Average PER	Bit Rate	Comments
1212	14	100	1526	0100	1526 1634	1634* 1747 1747 0032 0032* 0100		-165	12	22.8	-175	8	0.600 0.000	16 8	SMF Mode 1/B12. * Noncoherent.
1214	14	102	1519	0100	1519 1630	1630* 1803 1803 0032 0032* 0100		-164.3	12	25.47	-175	8	0.400	16	SMF Mode 3/B12. * Noncoherent.
1215	14	103	1519	0100	1519 1627 2047 2048	1627* 1757 1757 2047 2048 0032 0032* 0100		-164.4	12	25.05	-174	8	0.000 0.500	8 16	SMF Mode 3/B12. At 201430, XMTR off - reason unknown. * Noncoherent.
1217	14	105	1527	2300	1527 1642	1642* 1802 1802 2232 2232 2300		-164.9	12	25.9	-174	8	0.600	16	SMF Mode 3/B12. At 1528, Recorder "A" inoperative. Returned to operation at 1745. * Noncoherent.
1218	14	106	1519	2300	1519 1635	1635* 1747 1747 2248 2248* 2300		-164.7	12	27.19	-174	9	0.000 0.600	8 16	SMF Mode 3/B12. * Noncoherent.
1219	14	107	2113	0100	2113 2226	2226* 2337 2337 0032 0032* 0100		-164.5	12	28	-174	6	0.000	8	SMF Mode 3/B12. Acquisition 13 minutes late due to antenna emergency - iron stuck in front of rotating stairway. * Noncoherent.

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Table 33 (contd)

Pass No.	DSS No.	Day of Year	Acq. Time	End of Track	Ground Mode Start/Stop Time 1-Way	2-Way	3-Way	Signal Strength Avg (dbm)	Configuration Loop BW (Hz)	Temp Pre/ Post (°K)	Thres Pre/ Post (dbm)	No. of Cmds	Average PER	Bit Rate	Comments
1221	14	109	1450	0100	1450 1615	1615* 1714 1714 0033 0033* 0100		-164.3	12	27.5	-174	9	0.500	16	SMF Mode 3/B12. XMTR tripped off at 1923. * Noncoherent.
1222	14	110	1445	0100	1445 1602	1602* 1652 1652 0033 0033* 0100		-164.5	12	26.5	-175	8	0.450	16	SMF Mode 3/B12. * Noncoherent.
1223	14	111	1455	0100	1455 1603	1603* 1657 1657 0033 0033* 0100		-164.3	12	27.1	-174	8	0.075 0.750	8 16	SMF Mode 3/B12. * Noncoherent.
1224	14	112	1925	2300	1925 2026	2026* 2142 2142 2247 2247* 2300		-163.8	12	28.02	-174	6	0.000	8	SMF Mode 3/B12. * Noncoherent.
1225	14	113	1447	2100	1447 1545	1545* 1702 1702 2053 2053* 2100		-164.2	12	26.2	-175	10	0.000 0.500	8 16	SMF Mode 3/B12. * Noncoherent.
1226	14	114	1449	0100	1449 1610	1610* 1717 1717 0032 0032* 0100		-164.7	12	26.7	-175	10	0.200	8	SMF Mode 3/B12. * Noncoherent.

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Pass No.	DSS No.	Day of Year	Acq. Time	End of Track	Ground Mode Start/Stop Time 1-Way	2-Way	3-Way	Signal Strength Avg (dbm)	Configuration Loop BW (Hz)	Temp Pre/ Post (°K)	Thres Pre/ Post (dbm)	No. of Cmds	Average PER	Bit Rate	Comments
1228	14	116	1452	0100	1452 1603 2353 0014	1603* 1702 1702 2353 0014 0052 0052* 0100		-164.7	12	22.5	-175	10	0.200	16	SMF Mode 1/B12. At 2320, antenna to brake mode - dirt on transducer probe. * Noncoherent.
1229	14	117	1513	0100	1513 1928	1928* 0100		-165	12	22.7	-175	11	0.000 0.150	8 16	* Noncoherent. At 1515, lost all 400 cycle motor generator - went to one-motor generator set and 10 kw operation on XMTR. At 0029, XMTR off due to 400 cycle circuit braker opening. Back on XMTR at 0040.
1231	14	119	1434	2155	1434 1546	1546* 1648 1648 2155		-165	12	23.2	-174	5	0.040	8	SMF Mode 1/B12. * Noncoherent.
1232	14	120	1418	2200	1418 1518	1518 2200		-165	12	23.4	-174	7	0.300	16	SMF Mode 1/B12.

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Table 33 (contd)

Pass No.	DSS No.	Day of Year	Acq. Time	End of Track	Ground Mode Start/Stop Time 1-Way	2-Way	3-Way	Signal Strength Avg (dbm)	Configuration Loop BW (Hz)	Temp Pre/ Post (°K)	Thres Pre/ Post (dbm)	No. of Cmds	Average PER	Bit Rate	Comments
1233	14	121	1457	2155	1457 1602	1602 2155		-163.9	12	23.3	-175	8	0.300	16	SMF Mode 1/B12.
1235	14	123	1449	0040	1449 1556	1556 0040		-164.7	12	23	-175	7	0.300	16	SMF Mode 1/B12.
1237	14	125	1415	2025	1415 1519	1519 2025		-165.1	12	24.8	-175	6	0.000	8	SMF Mode 1/B12.
1238	14	126	1509	2055	1509 1630	1630 2055		-164.6	12	27.7	-174	4	0.350	16	SMF Mode 1/B12.
1239	14	127	1520	1600	1520 1600			-164.2	12	23.4	-175		0.250	16	SMF Mode 1/B12.
1240	14	128	1447	2054	1447 1632	1632 2054		-164.5	12	23	-175	4	0.300	16	SMF Mode 1/B12.
1241	14	129	2205	0100	2205 2327 0021 0100	2327 0021		-164.4	12	23.8	-175	3	0.058	16	SMF Mode 1/B12. At 2349 XMTR off. Cause unknown. At 2350 XMTR on at 20kw.
1242	14	130	2117	0100	2117 2230	2230 0100		-164.3	12	24	-175	2	0.274	16	SMF Mode 1/B12.
1243	14	131	2321	0256	2321 0036	0036 0256		-165.1	12	23.6	-176	4	0.880	16	SMF Mode 1/B12.
1244	14	132	2012	2329	2012 2104	2104 2329		-164.9	12	24.1	-175	5	0.350	16	SMF Mode 1/B12.
1246	14	134	1450	1900	1450 1604	1604 1900		-165	12	22.9	-176	8	0.800	16	SMF Mode 1/B12.
1247	14	135	1511	1900	1511 1610	1610 1900		-164.4	12	23.6	-174	5	0.200	16	SMF Mode 1/B12.
1249	14	137	1945	0000	1945 2050	2050 0000		-164	12	23.8	-175	5	0.333	16	SMF Mode 1/B12. Transmitter off at 2203, high voltage ac - overload tripped.
1259	14	147	1611	1928	1611 1711	1711 1928		-164.2	12	23.1	-174	5	0.250	16	SMF Mode 1/B12.

Pass No.	DSS No.	Day of Year	Acq. Time	End of Track	Ground Mode Start/Stop Time 1-Way	2-Way	3-Way	Signal Strength Avg (dbm)	Configuration Loop BW (Hz)	Temp Pre/ Post (°K)	Thres Pre/ Post (dbm)	No. of Cmds	Average PER	Bit Rate	Comments
1260	14	148	1410	1900	1410 1539	1539 1900		-164.6	12	22.4	-175	5	0.250	16	SMF Mode 1/B12.
1262	14	150	2110	0059	2110 2221	2221 0059		-164.1	12	23.8	-174	4	0.300	16	SMF Mode 1/B12.
1263	14	151	1608	1930	1608 1704	1704 1930		-162.7	12	24.3	-174	7	0.200	16	SMF Mode 1/B12.

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Table 33 (contd)

Pass No.	DSS No.	Day of Year	Acq Time	End of Track	Ground Mode Start/Stop Time 1-Way	2-Way	3-Way	Avg Signal Str dbm	Configuration Code	System Temp °K	Receiver Thresh (dbm)	No. of Cmds	Error Rate	Bit Rate	Comments
1265	14	153	1500	2000	1500 1557	1557 2000		-163.9	SMF Mode 1/B12	23.2	-174	7	0.300	16	
1267	14	155	1453	1900	1453 1547	1547 1900		-163.8	SMF Mode 1/B12	23.2	-175	7	0.350	16	
1268	14	156	1435	1900	1435 1526	1526 1900		-163.0	SMF Mode 1/B12	23.3	-175	8	0.350	16	
1269	14	157	1411	1900	1411 1511	1511 1900		-164.4	SMF Mode 1/B12	23.6	-175	5	0.200	16	
1270	14	158	1412	1900	1412 1511	1511 1900		-164.5	SMF Mode 1/B12	22.8	-174	7	0.300	16	
1275	14	163	1275	0100	1914 2006 2250 2318	2006 2250 2318 0100		-165.0	SMF Mode 1/B12	23.4	-175	7	0.250	16	At 2217, the antenna went to brake mode due to low film height (TFR-136158). Antenna back on point at 2224.
1277	14	165	1643	2247	1643 1747 1929 2020	1747 1929 2020 2247		-164.7	SMF Mode 1/B12	22.8	-175	8	0.150	16	At 1856, antenna went to brake mode. Pedestal emergency occurred when stop button was inadvertently engaged. At 2128, TCP was out of lock - spurious interrupt, cause unknown. TCP reloaded and back in lock at 2138.
1279	14	167	1609	2200	1609 1708	1708 2200		-164.4	SMF Mode 1/B12	23.4	-175	8	0.600	16	
1285	14	173	1615	2230	1615 1723	1723 2230		-166.0	P1/D1/B12	22.8	-174	6	0.400	8	High noise in last two hours of track. A 3-db drop in signal leve was indicated - reason unknown.
1287	14	175	1606	2101	1606 1816 1827 1834 1850 1904	1816 1827 1834 1850 1904 2101		-162.4	P1/D1/B12	24.2	-173	4	0.000	16	
1288	14	176	1506	1801	1506 1604	1604 1801		-165.6	P1/D0/B12 P1/D1/B12			1	BAD	8/ 16	
1292	14	180	1644	2230	1644 1741	1741 223[illegible]		-165.0	P0/D1/B12	N/A	N/A	19	0.000	8	

In general, the parity error rate was 0.000. However, DSS 14 was required to perform boresights during most passes. The parity error rate increased on passes on which boresights were performed.

The telemetry bit rate mode was at 8 and 16 bits/s during the second quarter. The rate for passes 1053 through 1058 was bad because the spacecraft was approaching solar occultation. During January, February, and March 1969, the parity error rate was 0.000 at 8 bits/s and 0.250 at 16 bits/s. The rate was below the threshold for good telemetry at 8 bits/s during April. However, for 16 and 64 bits/s, the rate was above the good telemetry threshold. During May, the parity error rate exceeded the threshold for all good telemetry at 8 bits/s except on pass 1237. The rate for 16 and 64 bits/s was also above 0.116. During June, the parity error rate exceeded the threshold for good telemetry in all cases except on pass 1287 at a bit rate of 16 bits/s.

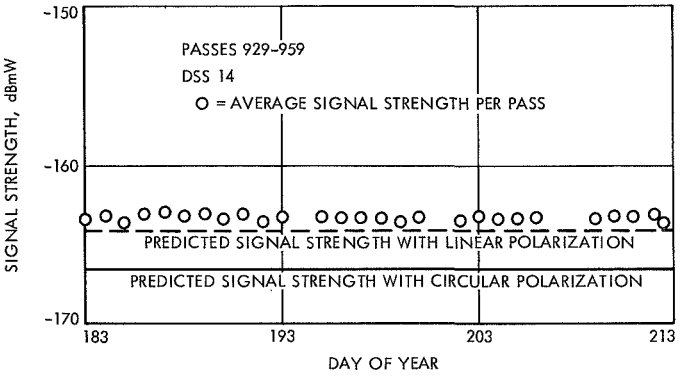

Fig. 72. Downlink signal strength vs day of year (July 1968)

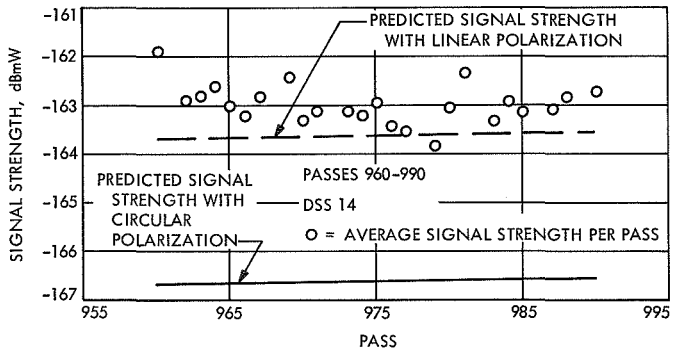

Fig. 73. Downlink signal strength vs pass number (August 1968)

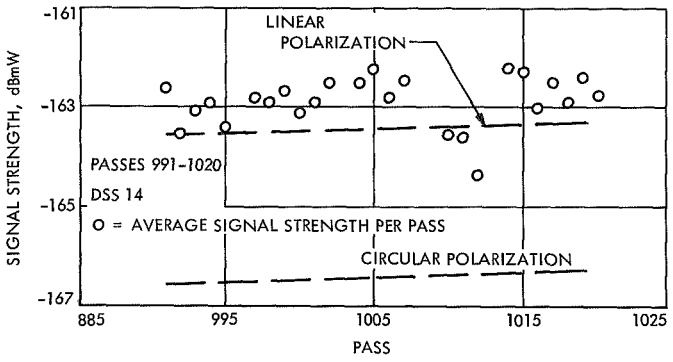

Fig. 74. Downlink signal strength vs pass number (September 1968)

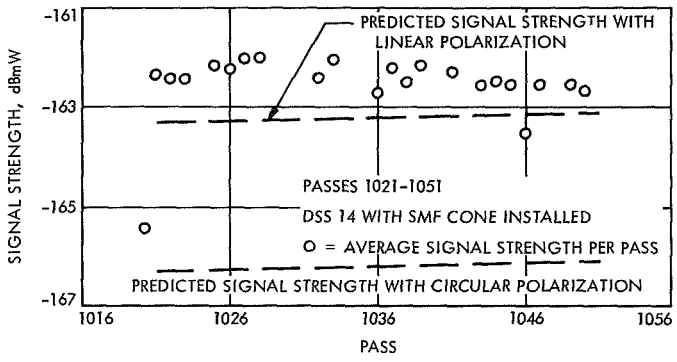

Fig. 75. Downlink signal strength vs pass number (October 1968)

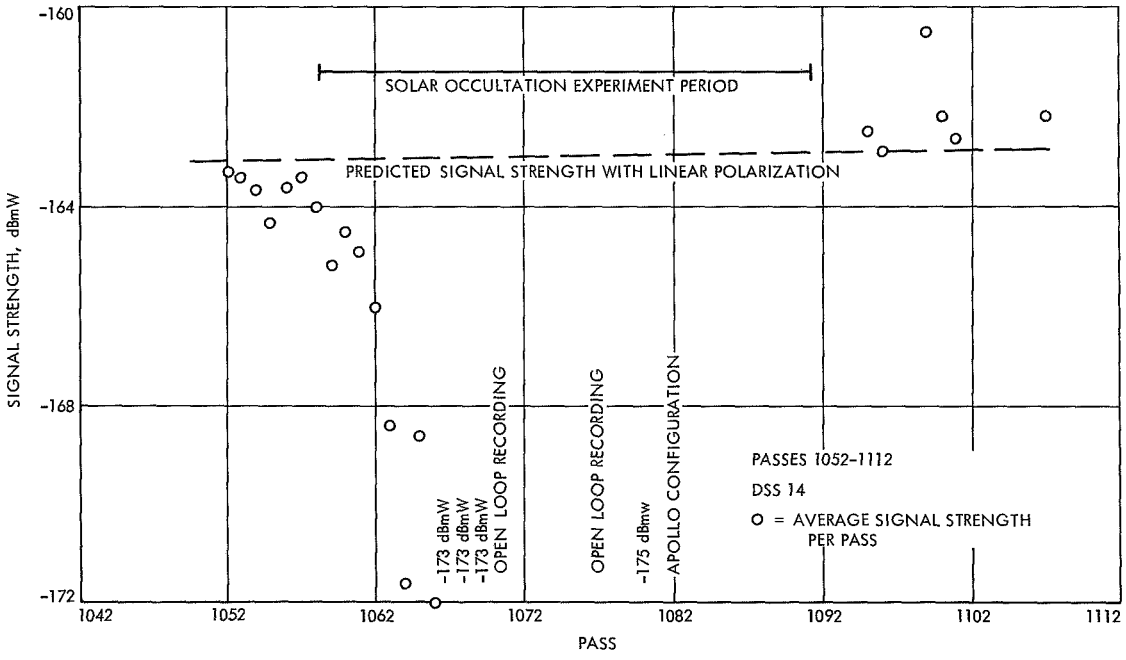

Fig. 76. Downlink signal strength vs pass number (November and December 1968)

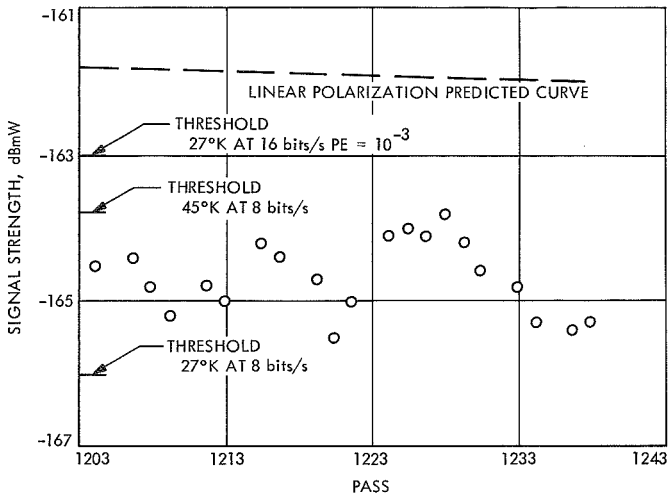

Fig. 77. Downlink signal strength vs pass number (April 1969)

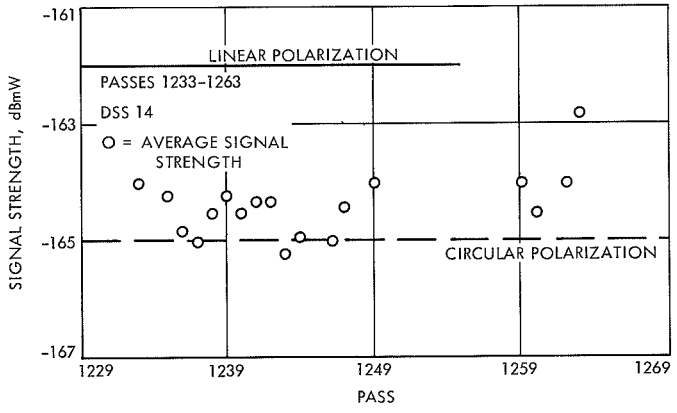

Fig. 78. Downlink signal strength vs pass number (May 1969)

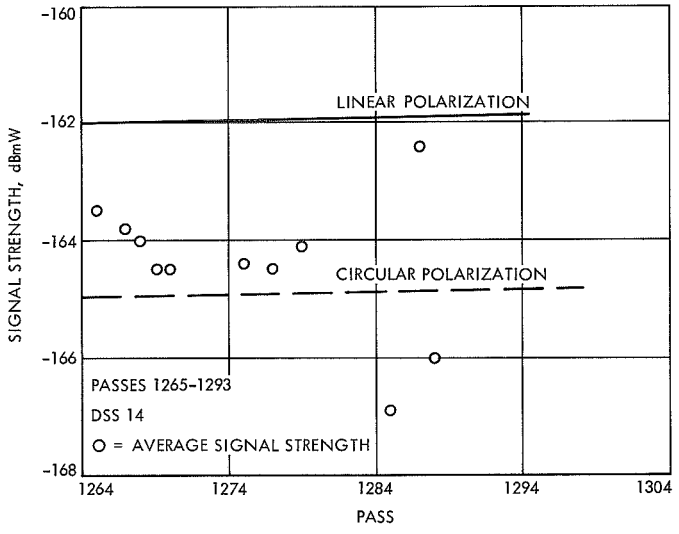

Fig. 79. Downlink signal strength vs pass number (June 1969)

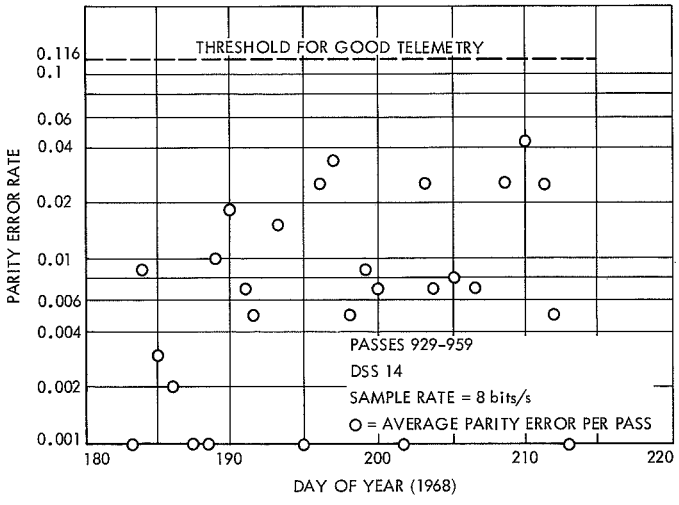

Fig. 80. Parity error rate vs day of year (July 1968)

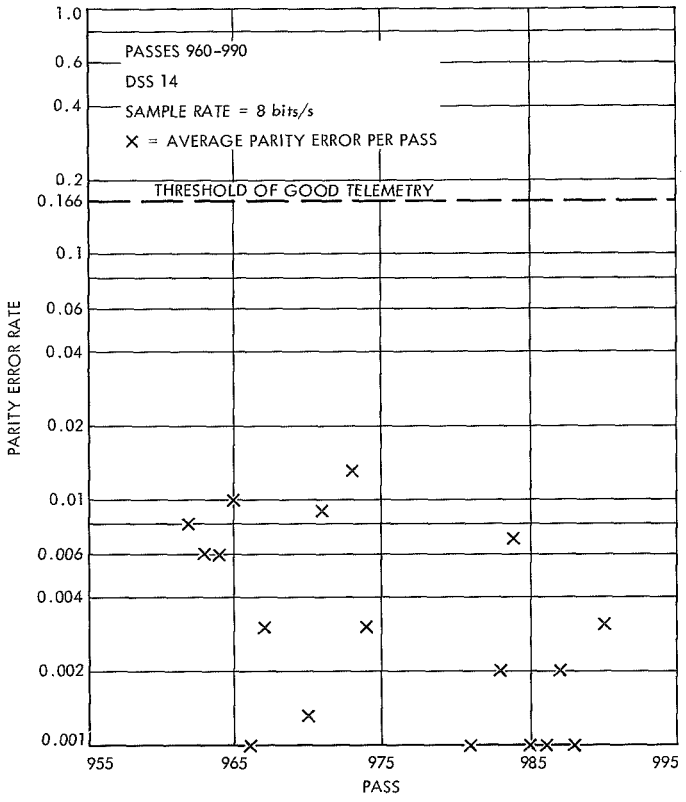

Fig. 81. Parity error rate vs pass number (August 1968)

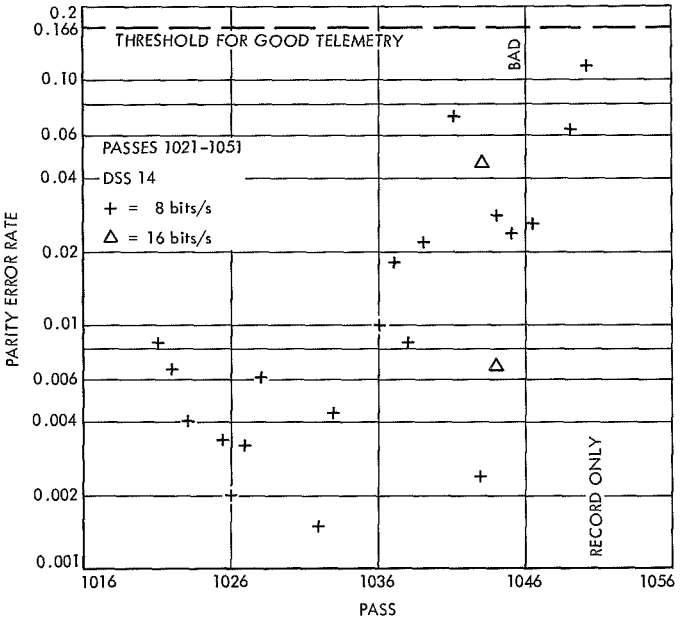

Fig. 83. Parity error rate vs pass number (October 1968)

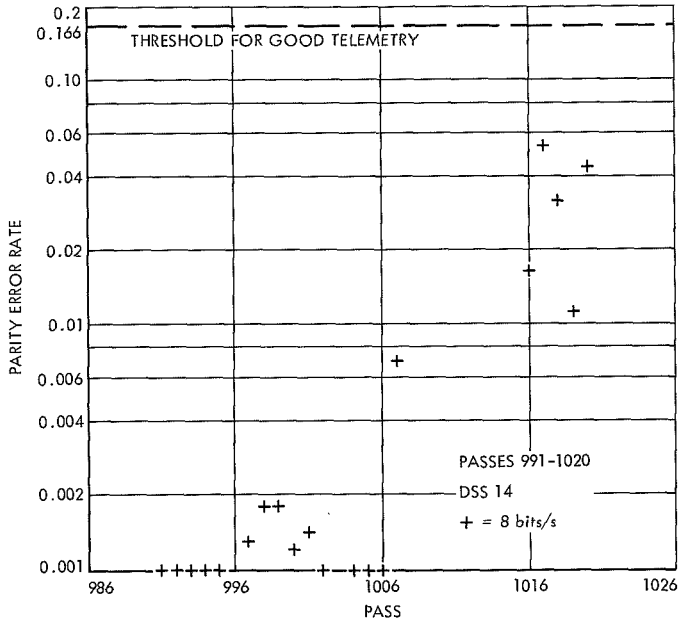

Fig. 82. Parity error rate vs pass number (September 1968)

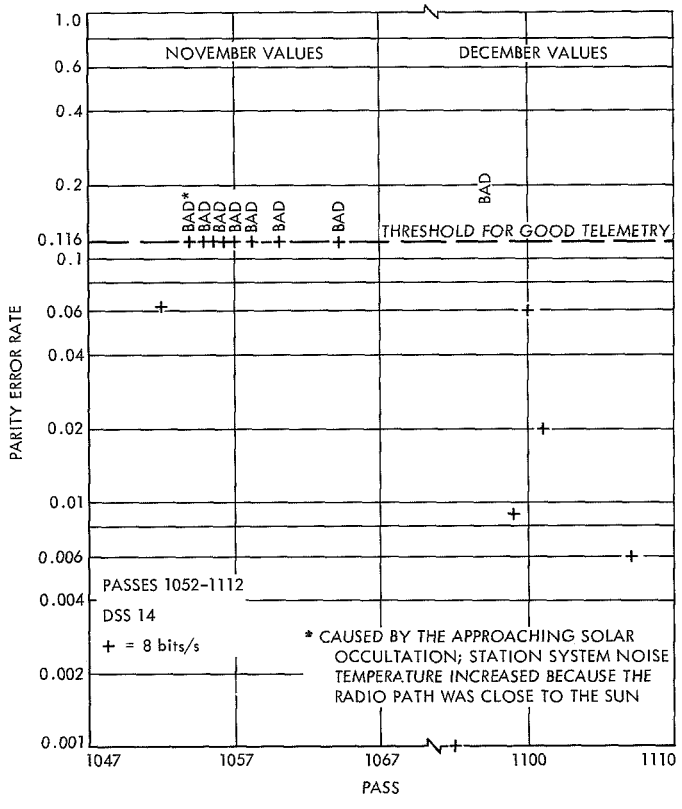

Fig. 84. Parity error rate vs pass number (November and December 1968)

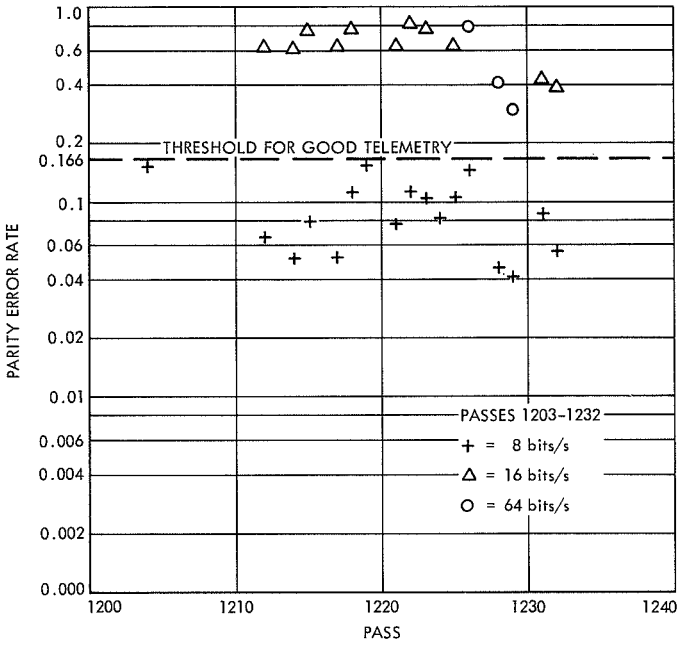

Fig. 85. Parity error rate vs pass number (April 1969)

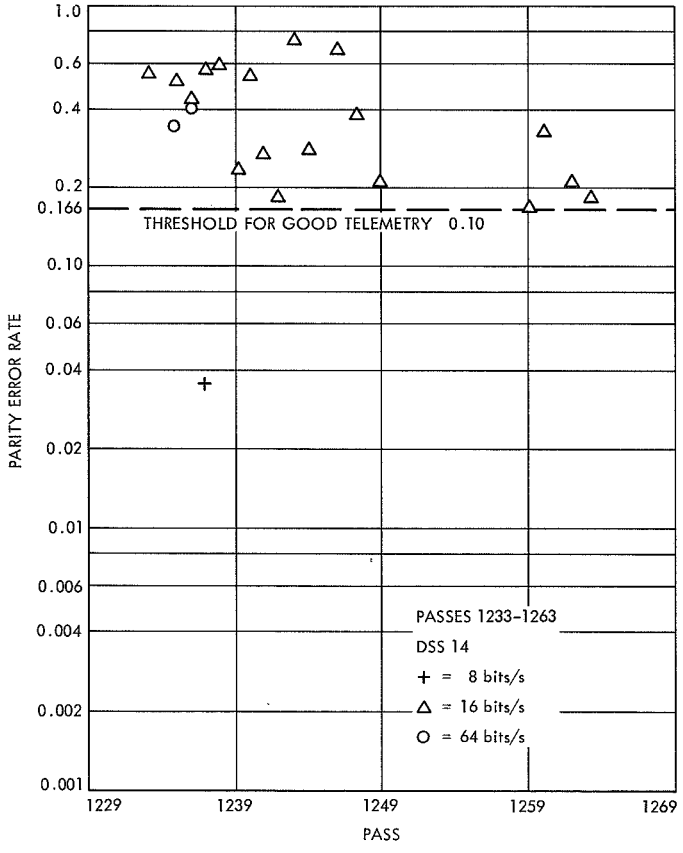

Fig. 86. Parity error rate vs pass number (May 1969)

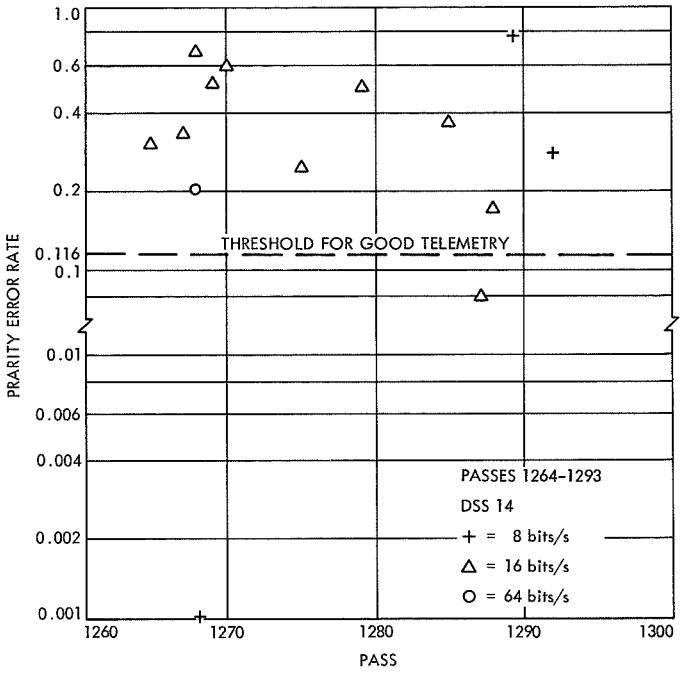

Fig. 87. Parity error rate vs pass number (June 1969)

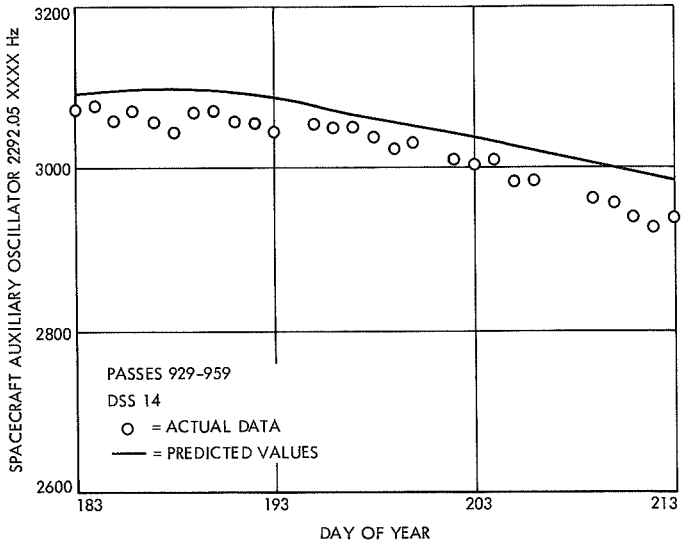

Fig. 88. Auxiliary oscillator frequency vs day of year (July 1968)

G. Predicted Frequency Performance

Plots of the measured auxiliary oscillator frequency are illustrated in Figs. 88–97 for the purpose of evaluating predictions. These plots are updated from one reporting period to another. When expected predictions

differ substantially from actual values, a new predicted curve based upon the latest actual values received is illustrated. When the spacecraft was tracked in the two-way noncoherent mode, the plot only represents an estimation. At 8 bits/s, the telemetry data was recycling every 28 min. By monitoring the subcommutator identification (SCID) frames 10, 23, and 24, and word 19 for receiver-lock indication, the maximum error for receiver-lock time could be resolved down to 11 min 24 s. With the station tuning at 3 Hz, the receiver-lock time would be a maximum frequency error of 34 Hz.

No acquisitions were made on channel 6 during July, August, and September, and no acquisitions were made on channel 7 during November and December. Best-lock frequency vs pass number is presented in Figs. 98–105.

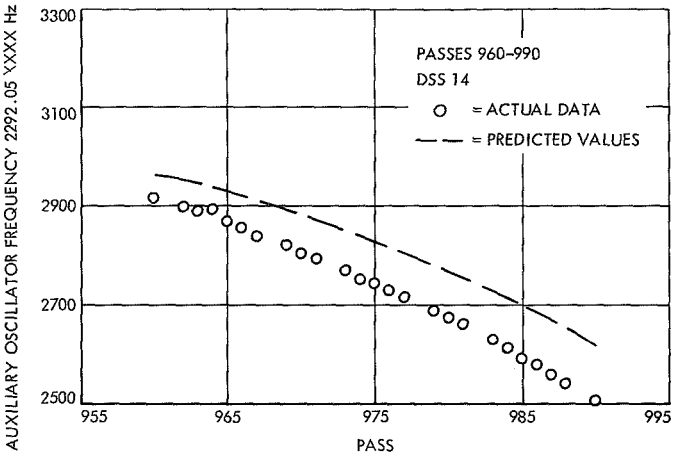

Fig. 89. Auxiliary oscillator frequency vs pass number (August 1968)

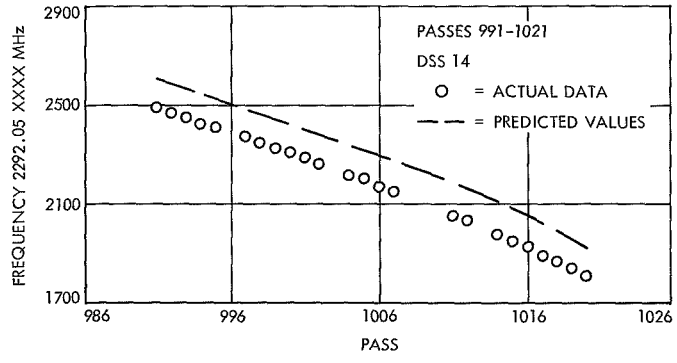

Fig. 90. Auxiliary oscillator frequency vs pass number (September 1968)

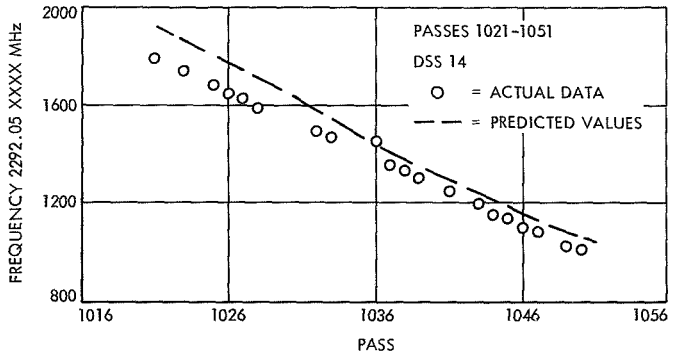

Fig. 91. Auxiliary oscillator frequency vs pass number (October 1968)

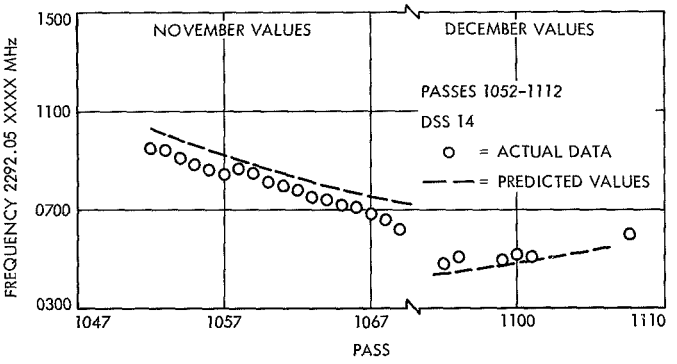

Fig. 92. Auxiliary oscillator frequency vs pass number (November and December 1968)

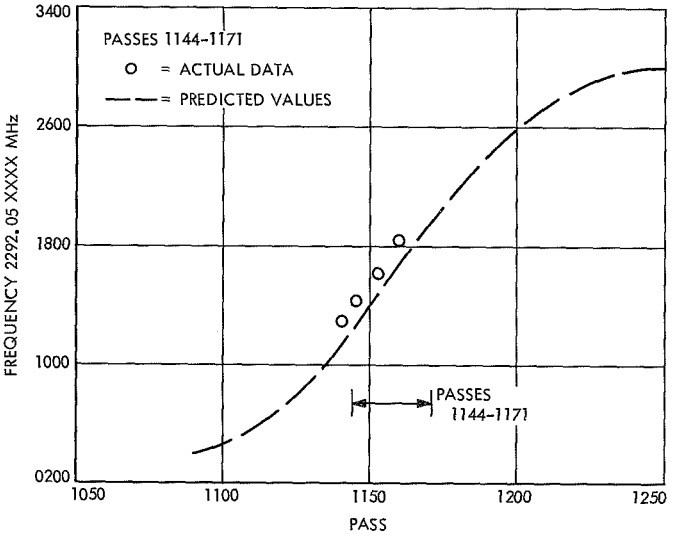

Fig. 93. Auxiliary oscillator frequency vs pass number (February 1969)

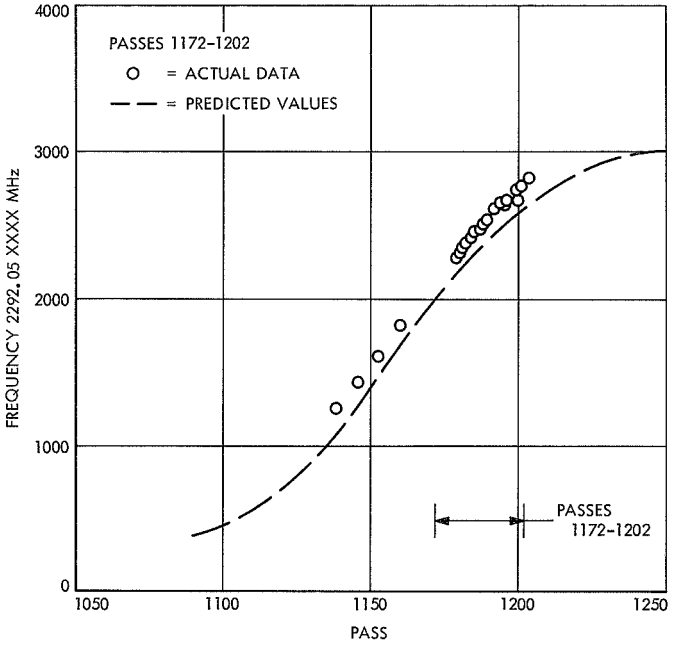

Fig. 94. Auxiliary oscillator frequency vs pass number (March 1969)

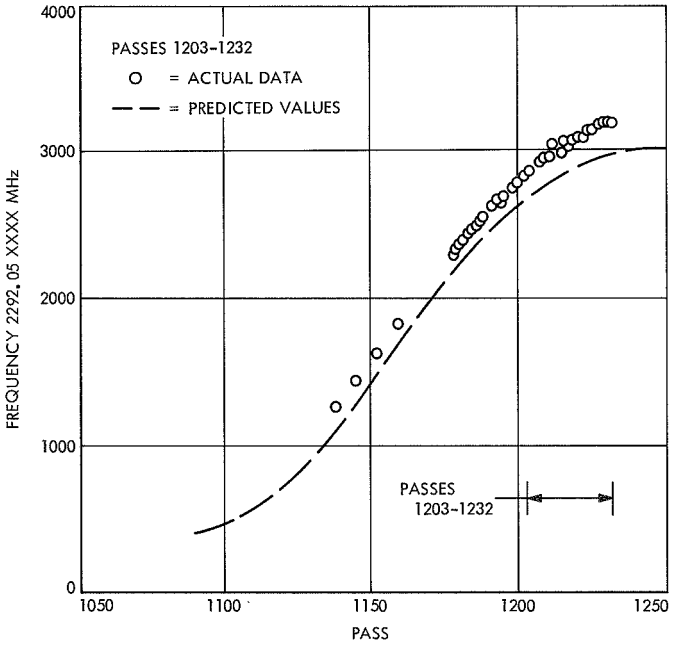

Fig. 95. Auxiliary oscillator frequency vs pass number (April 1969)

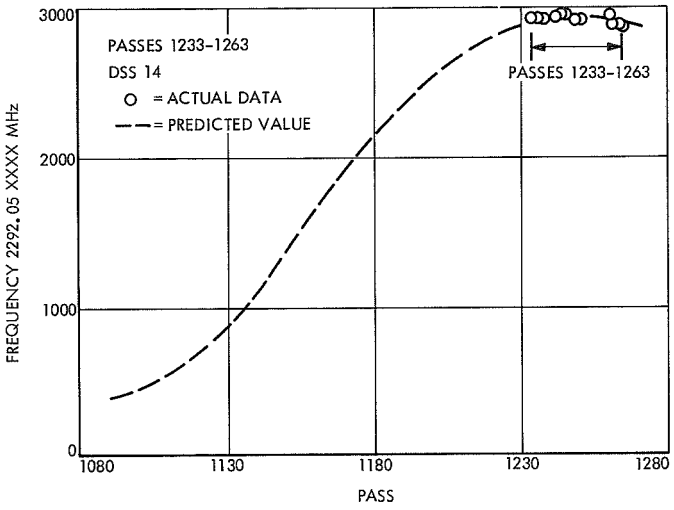

Fig. 96. Auxiliary oscillator frequency vs pass number (May 1969)

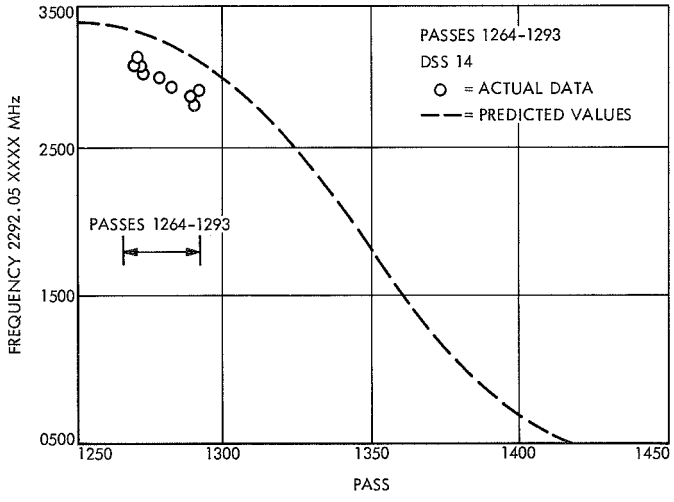

Fig. 97. Auxiliary oscillator frequency vs pass number (June 1969)

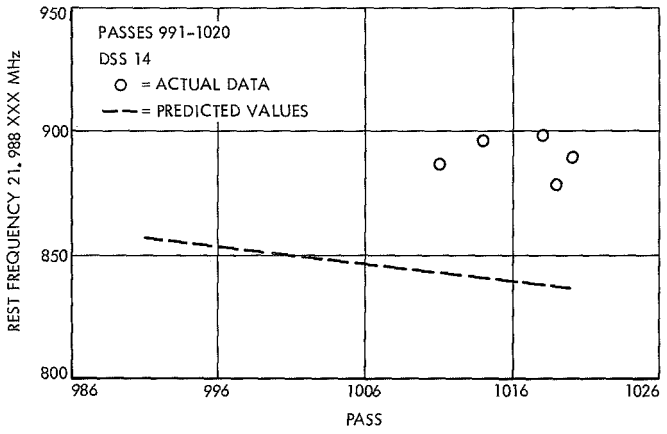

Fig. 98. Best-lock frequency vs pass number (channel 7, receiver 2, September 1968)

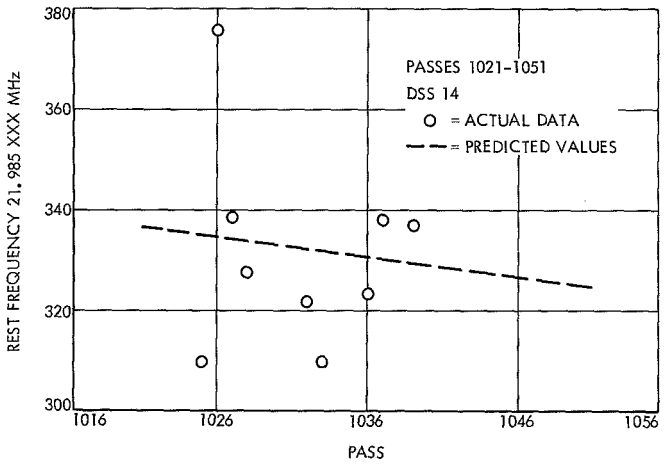

Fig. 99. Best-lock frequency vs pass number (channel 6, October 1968)

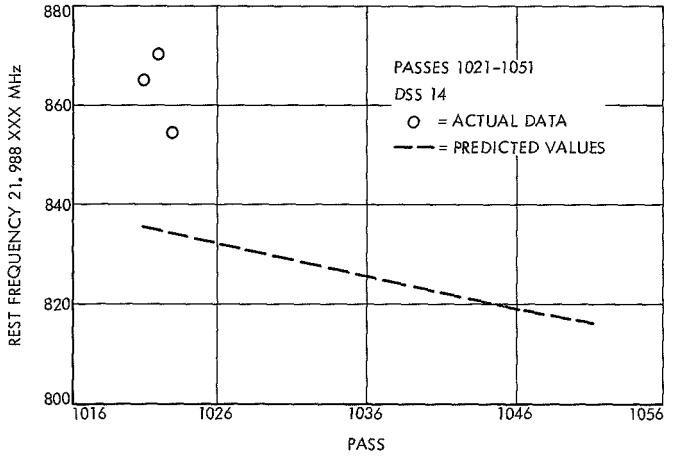

Fig. 100. Best-lock frequency vs pass number (channel 7, October 1968)

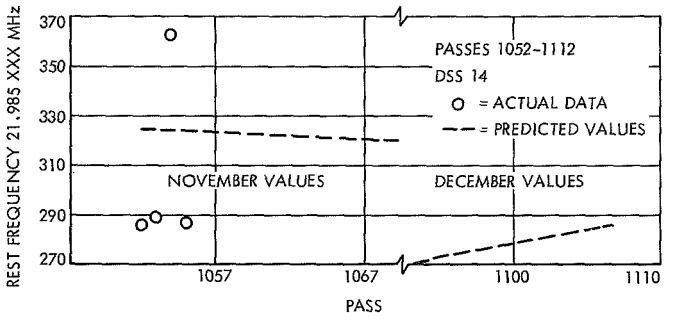

Fig. 101. Best-lock frequency vs pass number (channel 6, November and December 1968)

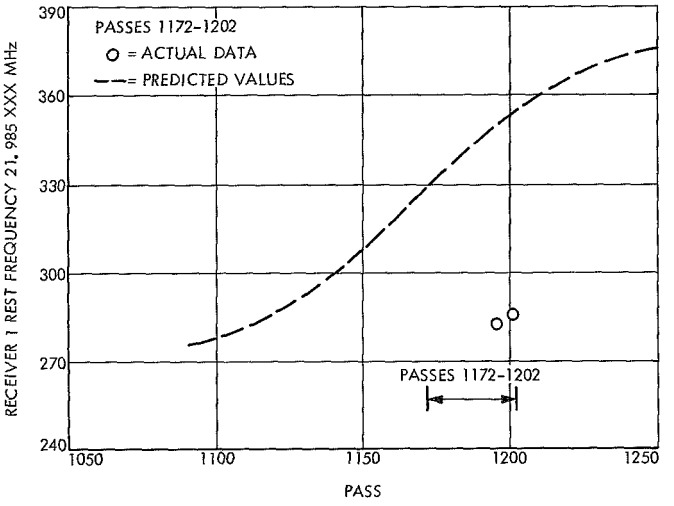

Fig. 102. Best-lock frequency vs pass number (channel 6, March 1969)

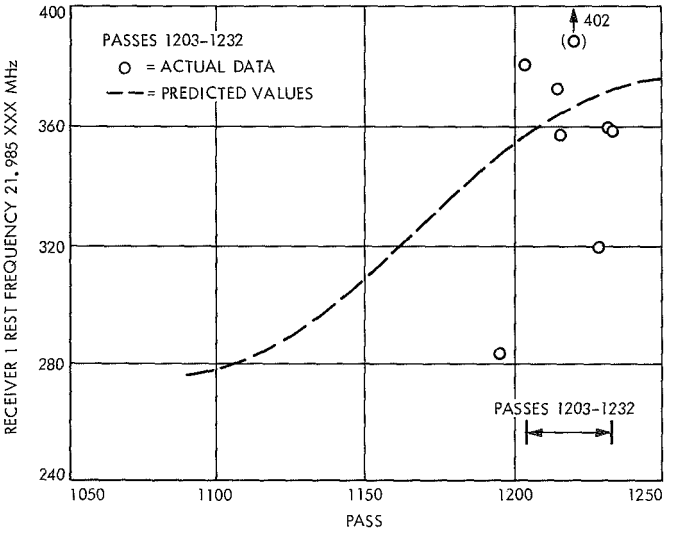

Fig. 103. Channel 6 best-lock frequency vs pass number (April 1969)

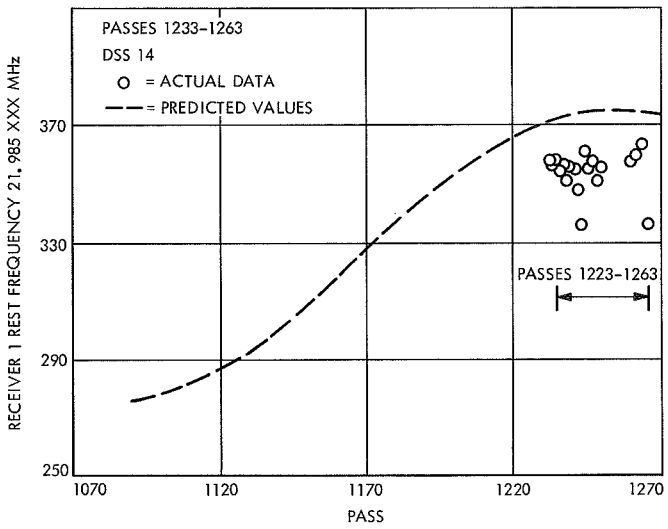

Fig. 104. Channel 6 best-lock frequency vs pass number (May 1969)

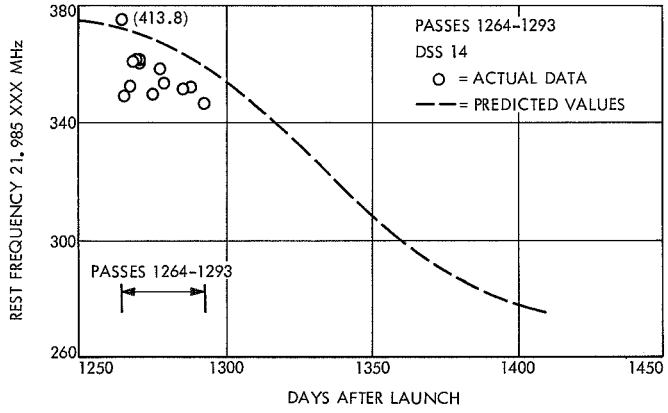

Fig. 105. Channel 6 best-lock frequency vs pass number (June 1969)

H. Predicts and Commands

Predicts generated for *Pioneer VI* to July 1, 1969, are presented in Table 34. During April, analysis indicated a bad orbit solution was being used to generate predicts. The orbit error varied from 200 Hz off at the start of the report period to 300 Hz off at the end of the period. The predicts were bad because of a lack of data points to help extend the orbit. It was decided to return to the original orbit conditions (Table 34, runs 90M and 90N).

The cumulative total of commands transmitted to *Pioneer VI* at the end of June 1969 was 6017. A total of 698 commands were transmitted during this reporting period. Transmission of commands to the spacecraft was resumed during September 1968 for the first time since the end of March 1968. The problems that caused the cessation of command transmittal were reported in the previous annual report document. Commands by pass and day for this reporting period are reported in Table 33. Command anomalies are reported in the pass chronology.

Table 34. Prediction summary

Predict No.[a]	Auxiliary oscillator frequency or driver frequency, MHz	Ground transmitter synthesizer frequency for best lock at zero doppler, MHz	Coverage	Sample rate, s
80A	2292.053000	21.98536500	6/1–8/1/68	900
80B	2292.053000	21.98886500	6/1–8/1/68	900
81A	2292.052900	21.9853500	8/1–9/1/68	900
81B	2292.05	21.98	8/1–9/1/68	900
82A	2292.052200	21.985345	9/1–10/1/68	900
82B	2292.05220	21.988845	9/1–10/1/68	900
83A	2292.051360	12.985330	10/1–11/1/68	900
83B	2292.051360	21.988828	10/1–11/1/68	900
84A	2292.050510	21.985290	11/1–12/1/68	900
84B	2292.050510	21.988830	11/1–12/1/68	900
85A	2292.050400	21.985295	12/1/68–01/1/69	900
85B	2292.050400	21.988820	12/1/68–01/1/69	900
86A	2292.050410	21.985345	01/1–2/1/69	900
86B	2292.050410	21.988790	01/1–2/1/69	900
87A	2292.051650	21.985315	2/1–3/1/69	600
87B	2292.051650	21.988902	2/1–3/1/69	600
88A	2292.052300	21.985340	3/1–4/1/69	600
88B	2292.052300	21.988920	3/1–4/1/69	600
VP5	2292.053000	21.988940	7/1–7/1/70	1800
89A	2292.053000	21.985370	4/1–5/1/69	600
89B	2292.053000	21.988940	4/1–5/1/69	600
90A	2292.053000	21.985350	5/1–6/1/69	600
90B	2292.053000	21.988890	5/1–6/1/69	600
90M	2292.053000	21.985350	5/10–6/1/69	600
90N	2292.053000	21.988890	5/10–6/1/69	600
91A	2292.053000	21.98	6/1–7/1/69	600
91B	2292.053000	21.988950	6/1–7/1/69	600

[a]A = channel 6; B = channel 7; VP = view period; M = channel 6 special run; N = channel 7 special run.

I. Pass Chronology

Tracking periods covered are identified by pass number, which is the number of times since launch that the

spacecraft has been above the horizon of a particular station. Unless otherwise noted, the following entries refer to DSS 14.

Pass 931. Because the engineering support group was working on a low spot in the hydrostatic bearing, there was a short delay in spacecraft acquisition.

Pass 938. A communications patching problem developed at DSS 14 that caused the telemetry command processor science data and tracking data handling subsystem teletype data to be garbled. The normal flow of data was resumed after a 13-min delay.

Pass 941. Station computer stopped tracking three times because of commercial power transients.

Pass 957. All ground communications were lost between DSS 14 and the SFOF for nearly 2 h because the building contractor at the station inadvertently cut the main cable linking DSS 14 with the Goldstone Communication Center. Tracking was completed in the record-only mode.

Pass 973. Magnetic tapes IA and IB failed to record the receiver in-lock indication during the first half of the pass because of a damaged patch board. The problem was corrected by reseating the associated patch cord.

Pass 983. The demodulator was 17 min late in locking up because a normally unused source switch was left in the tape position.

Pass 979. Engineering data was invalid at 1331. The TCP program was reloaded at 1338. A spurious interrupt dumped the program, and reloading was necessary. At 1410, engineering telemetry data sheets indicated that values were out of limit; the program was reloaded.

Pass 998. A hydrostatic bearing pad recess flow valve failure caused the antenna to go to brake mode. Repair of the valve relieved the brake mode condition.

Pass 1000. TDH data condition code problems were experienced from 1707 to 1754. One-way doppler button was in *off* position.

Pass 1001. A second autocollimator was being installed at DSS 14; therefore, the angle data for pass 1001 was invalid. Installation of the autocollimator was completed on pass 1002.

Pass 1002. Downlink signal strength became degraded on both receivers. To resolve the problem maser 1 was replaced by maser 2.

Pass 1005. Because of incorrect printout of battery current and temperature, 1 min 45 s of data was lost. The TCP was reloaded.

Pass 1007. Spacecraft acquisition was accomplished in the two-way noncoherent mode on channel 7. All commands transmitted were successfully received by *Pioneer VI*. Subsequent acquisitions were made on channel 7.

Passes 1011 and 1012. The antenna went to brake mode because of low oil film height on pad 3; close examination revealed dirt in the area from 127 to 140 deg. This problem was resolved during regularly scheduled maintenance periods later in the year. At 1515 on pass 1011, command 101 stopped on the 19th bit; the command was retransmitted at 1517.

Pass 1014. At 1746, the receiver glitched in and out of lock, causing TCP to lose word frame sync.

Pass 1022. Tuning required 42 min (a TDH problem); 12 min of metric data was missing. Twenty-six bad data condition code points, other than tuning, were counted.

Pass 1023. Tuning took 43 min. Ten bad data condition code points, other than tuning, were counted.

Pass 1027. Servo-hydraulics pump was lost at 1558: 15 due to operator error. At 1558:38, the receiver and TCP were out of lock; they were back in lock at 1604.

Pass 1028. Tuning took 48 min. At 2313, transmitter was off due to a broken coolant hose at elevation bearing. One bad data condition code point, other than tuning, was counted.

Pass 1032. Tuning took 46 min. At 1435, there was no telemetry output from receiver 1 because of loose connector; receiver 2 was switched on until return to receiver 1 at 1544. Transmitter failed because of high-voltage ac overcurrent at 1530:30. Transmitter turned on at 1532.

Pass 1033. Power glitch caused the TCP to lose program at 1715; TCP was reloaded and in lock at 1721.

Pass 1032. Tuning took 46 min. At 1435, no telemetry output was received from receiver 1 due to loose connector; switched to receiver 2. Receiver 1 was switched on at 1544. At 1530:30, the transmitter failed due to high-voltage ac overcurrent. Transmitter was turned on at 1532.

Pass 1036. Tuning took 46 min. Nine bad data condition code points, other than tuning, and 2 garbled points were counted.

Pass 1037. Tuning took 45 min. Four bad data condition code points, other than tuning, were counted.

Pass 1043. Tuning took 64 min. Ninety-three bad data condition code points, other than tuning, and 2 garbled points were counted. At 1448 and 2028:25, the transmitter failed, accounting for some of the bad data time. Twelve min of data at 1-s sample rate helped raise the good data percentage.

Pass 1044. Tuning took 38 min. Eighty-two bad data condition code points, other than tuning, and 1 garbled point were counted. The cause of the high number of bad data condition code points was not determined.

Pass 1045. Tuning took 30 min. Ninety-two bad data condition code points, other than tuning, were counted.

Pass 1046. Tuning took 37 min. Other than tuning, there were 127 bad data condition code points counted.

Pass 1047. The receiver was out of lock at 1630. The polarizer spun out of control, causing loss of uplink. As a result commands 101 at 1645 and 061 at 1700 apparently did not reach the spacecraft. Tuning took 75 min. This was a two-way coherent pass. Other than tuning, there were 399 bad data condition code points counted.

Pass 1049. Tuning took 71 min. This was a two-way coherent pass. Other than tuning, there were 282 bad data condition code points counted. The receiver glitched badly throughout the pass.

Pass 1050. Tuning took 45 min. This was a two-way coherent pass. A total of 3 h 13 min of track was taken at a 10-s sample rate. Other than tuning, there were 354 bad data condition code points counted.

Pass 1052. DSS 12 GOE failed to transmit command 101.

Pass 1177. Station tuned 101 min in attempts to gain two-way lock, having used an incorrect frequency in an attempt to acquire the spacecraft in two-way mode. The antenna went to brake because of low film height on Pad 3. Two min 33 s of telemetry data was lost.

Pass 1178. The station had a utility power surge and lost binary-coded decimal time. It was suspected the high noise was a result of a timing error caused by the power surge. The antenna went to brake and the receiver dropped lock because of low film height at 2025:56. One min 20 s of data was lost.

Pass 1181. The station tracked in a two-way noncoherent mode. No anomaly was found as a cause of high noise present throughout this pass. The received signal strength was 9.4 dB above threshold; the receiver was believed dropping cycles.

Pass 1188. At 1611:27, the station switched to SMF mode 2 and attempted to acquire the spacecraft on channel 6. Three h 5 min was lost in this unsuccessful attempt. Channel 7 was acquired at 2010:20 and was noisy.

Pass 1201. The station had numerous blunder points and receiver out-of-lock indications. Received signal strength was 9 dB above receiver threshold. The station was suspected to have an equipment malfunction. Equipment which caused the high noise and blunder points was believed to be the doppler counter. Figure 63 shows the large deviation of raw doppler data from nominal.

Pass 1202. The station had numerous blunder points and receiver-out-of-lock indications. It was determined that the doppler counter was not updating in the 10-millionth count. The station was requested to make an investigation to determine why the receiver was dropping lock so frequently. Figure 64 illustrates the complete randomness of the raw doppler data on Pass 1202.

Pass 1205. The PC 141 in the timing system jumped time and caused a failure in the antenna pointing system. This problem was corrected by resetting the PC 141.

Pass 1207. The rectifier beam interlock switch tripped because of high voltage overload and caused loss of transmitter power. The switch was reset and all indications returned to normal.

Pass 1209. The station had many blunder points. Received signal strength was 7.3 dB above receiver threshold.

Pass 1212. The station experienced high noise: a switch was made from rubidium 1 to rubidium 2, but high noise continued. Communication outage occurred from 2033 to 2039. There were many garbled lines of TDH. High noise appeared to be caused by a timing offset. Noise spikes ranged from 60 to 80 cycles.

Pass 1219. At 2050, an antenna emergency occurred because the rotating stairway was blocked; delay caused late acquisition of the spacecraft.

Pass 1221. At 1923:25, beam voltage interlock kicked the transmitter off due to air condition overcurrent. Interlock was reset; transmitter was on at 1923:35.

Pass 1223. From 2050 to 2149, station tracking data was bad; the problem was caused by a bad start (sample timing off). The TDH punches were restarted and operation was normal. All data was lost between 2050 and 2149.

Pass 1225. The PC 141 clock had an error of 200 ms from 1858 to the end of pass at 2100. Station master equatorial was out, and *Pioneer VI* was tracked in precision mode 2.

Pass 1228. The antenna went to brake mode. Dirt was found on the film height transducer probe.

Pass 1229. The transmitter was operating at 10 kW instead of 20 kW because of motor generator set outage. The problem was in the frequency regulator, which was replaced.

Pass 1235. There were 10 blunder points recorded on the data.

Pass 1237. The TCP glitched in and out of lock from 1415 until 2025, when the pass was terminated to check the problem. Receiver 2 was prime for telemetry only from 1902 to 1930. Receiver 1 was prime for telemetry from 1930 to pass termination. The station experienced high noise and four blunder points.

Pass 1238. At 1644, TCP beta was noted as glitching in and out of lock. At 1759, the master equatorial went to brake mode; PC 141 was off. At 1800, the antenna went to precision mode 1, and PC 141 was reset at 1801. At 1956, the antenna went to sidereal mode; PC 141 was again off. DSS 14 was unable to keep PC 141 set, and permission was given to change rubidiums. At 2025, the station switched from rubidium 2 to rubidium 1; PC 141 was reset at 2030.

Pass 1240. Tracking data was garbled from 1445 to 1511. The station replaced card A-25 in PC 142. The station was notified of a large blunder point occurring every 4 min. Analysis indicated a doppler counter problem. The TDH was taken off line for troubleshooting at 1710. At 1744, TDH was sampling and on line; card B-8 in doppler counter 2 was replaced. All angles were bad because the antenna was in precision mode 2 because of master equatorial update.

Pass 1241. A loss of transmitter power occurred because of low beam voltage. A readjustment was made.

Pass 1242. Because of a power supply intermittent open source, the 1-MHz reference was off from the distribution amplifier. As a result, the FTS II clock stopped at 2225. The clock was reset at 2250.

Pass 1246. The station tracked in precision mode 2. Many receiver glitches were observed during the pass. At 1635, the antenna went to brake mode; the emergency stop button was accidentally actuated. The antenna was back on the spacecraft at 1638.

Pass 1247. During troubleshooting of a declination angle readout problem, the wrong card was pulled and the antenna went to brake mode. The declination readout problem was corrected at 1744.

Pass 1249. The transmitter went off at 2203 because of a high-voltage ac overload. The transmitter went on at 2204. From 2229 to 2258, the TDH VCO counter had a trigger problem. This problem was corrected by an adjustment at 2258.

Pass 1267. Three severe jumps occurred in the doppler data received from DSS 14. No anomaly was located at the station. Solar activity was believed to be the cause.

Pass 1268. Blunder points still appeared in the doppler data. Station equipment was rechecked but no anomaly was found. Solar activity in the area of *Pioneer VI* continued.

Pass 1269. Four blunder points were recorded in the doppler data. Solar activity still existed in the *Pioneer VI*

area, but the intensity was low. Station system noise temperature during this pass was high. High-voltage ac overload caused loss of transmitter power; the breaker switch was reset.

Pass 1275. The antenna at DSS 14 went to brake mode at 2217 because of low film height; the antenna was back on point at 2224.

Pass 1277. The antenna went to brake mode at 1856 because the pedestal emergency stop button was inadvertently engaged. The antenna went to precision mode 1 at 1857.

Pass 1285. The last 2 h of track in the high noise mode showed a 3-dB drop in received signal level. No apparent cause was found. This was the first *Pioneer VI* pass tracked after installation of the S-band Cassegrain ultracone.

Pass 1287. Difficulty was encountered in the acquisition of the spacecraft on channel 7. Although the spacecraft was acquired on channel 7, it was lost after a few minutes because the polarizer was rotated to set up for acquisition on channel 6. The spacecraft was then acquired and tracked on channel 6 with no further problems.